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Minerals Yearbook

1975

Volume III

AREA REPORTS: INTERNATIONAL

Prepared by staff of the

BUREAU OF MINES

UNITED STATES DEPARTMENT OF THE INTERIOR • Cecil D. Andrus, Secretary

BUREAU OF MINES • Roger A. Markle, Director

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.

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Foreword

The Federal Government, through the Minerals Yearbook and its predecessor volumes, has reported annually on mineral industry activities for 94 years. This edition discusses the performance of the worldwide mineral industry during 1975. In addition to statistical data, the volumes provide background information to assist in interpreting the year's developments. Content of the individual volumes 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 chapter on mining and quarrying trends, and a statistical summary.

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, and the Commonwealth of Puerto Rico. 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 the international minerals industry in general and its relationship to the world economy.

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

ROGER A. MARKLE, *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*

Contents

Minerals in the World Economy

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

The general downturn in world economic activity that occurred in 1975 was clearly seen in almost every aspect of the mineral industry that can be readily quantified. Sharp downturns measured among market economy nations, particularly the developed market economy nations, were partly compensated for, in worldwide figures, by continued growth among the centrally planned economy countries of Eastern Europe. The world's economic problems, probably dominated by the sharp rise in the cost of energy materials, combined to reverse the general upward trends in mineral production, trade, and consumption that extended from recovery from the recession of 1958 until 1974. Specifically, the United Nations index of world extractive mineral industry output for 1975 declined 2 points to 114 (1970=100), a downturn of 1.7% compared with the index for 1974 to a level approximately equal to that of 1973.

The market economy nations registered a 5-point (4.4%) decline from 112 to 107, while the centrally planned economy nations recorded a 7-point (5.6%) increase from 124 to 131. In terms of current dollars (that is, without adjustment for inflation), the dollar value of world mineral production probably increased somewhat, but the United Nations index is adjusted for inflation. The index does, however, incorporate real gains in costs of products, so quantitative levels of mineral production diminished even more substantially than would be indicated by this value-based index. In terms of quantitative output statistics, 1975 output of 61 of 81 mineral commodities discussed in this chapter declined compared with 1974 levels, production of one commodity equaled the 1974 level and only 19 commodities registered increases.

In the area of mineral commodity trade, without adjustment for inflation, a decline of about 3% from the 1974 level of $263,140 million was indicated by preliminary returns. Owing to the continued increases in the unit value of mineral commodities in terms of current dollars, this decrease suggests a substantially greater decline in the volume of materials moved in 1975.

No comprehensive index for consumption of all commodities is available, but declines were registered on a worldwide aggregate basis for major commodities, including iron ore, iron and steel scrap, iron and steel, aluminum, copper, lead, zinc, tin, sulfur, phosphate rock, potash, and petroleum. Modest gains were registered by nitrogen fertilizers, coal, and natural gas. In terms of the aggregate of all forms of energy, total world consumption advanced 1.1% between 1974 and 1975, but world per capita consumption declined 0.6% in 1975. Perhaps more significant, however, was the fact that total energy consumption in market economy nations fell, albeit only 1.4%, while the total world increase was the result of a 6.8% increase credited to centrally planned economy nations.

The data on investment in mineral industry activities, although far from comprehensive, provide perhaps the brightest aspect of an otherwise depressed year. Investment data available seem to indicate that corporate expenditures at least paced the inflationary trend; therefore, provisions seemingly were being made for continued

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

growth when commodity demand again increases. One other aspect of brightness could be found in the quarter-by-quarter results of the United Nations industrial production indexes. Most of these index numbers for most world areas showed an upturn in the final quarter of 1975, portending recovery during 1976 of at least some of the ground lost in output levels.

The reopening of the Suez Canal undoubtedly had a desirable impact on the cost of at least some mineral commodity transportation, but most of the newer ore carriers and tankers are unable to use the Suez because of their immense size, both width and draft; therefore, the advantages to the mineral industry are somewhat limited. Moreover, any effort to improve the waterway to a size adequate to handle the giant bulk carriers would prove very time-consuming and costly. These factors, together with the continued unsettled conditions in the Near East, make improvement projects unlikely.

PRODUCTION

The estimated value of world crude mineral production in 1975 was $191,600 million in terms of constant 1973 dollars, about 1.7% below the revised 1974 level of $195,000 million. The quantitative decline, however, was significantly greater than is suggested by the 1.7% figure, because of increases in the unit prices of many commodities. Even in terms of constant dollars, most mineral commodities had higher unit values in 1975 than in 1974, and thus the decline in volume of production was partly compensated for by unit-price increases.

The following tabulation summarizes approximate data on value of world mineral production for selected years in the period 1950–75:

Year	Billion constant 1973 dollars: Value of 53 [1] major crude mineral commodities [2]	Billion constant 1973 dollars: 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	162.0	195.0
1975	159.2	191.6

[1] The list of commodities included appears in table 5 of the 1974 edition 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, 1974 and 1975 are as reported in Annales des Mines, December 1975, p. 13; data for 1972, 1974, and 1975 are extrapolated from the 1973 Annales des Mines figures on the basis of the United Nations index of extractive industry production in the United Nations Monthly Bulletin of Statistics, August 1976, p. xii.

[3] Data were 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 the 1974 edition of this chapter under "Value of World Mineral Production."

These figures belittle the role of the mineral industry in the world economy however, for they represent an approximation of the value of minerals in their crudest form—the actual product of a mine—and not the enhanced value that results from beneficiation, smelting, and other downstream processing, as well as the value added in transporting much of these mineral materials from the nations where they are produced in the crude form to the nations where they are ultimately consumed. If the value added through processing—smelting of metals, refining of oil, and manufacture of basic materials such as cement and fertilizers—were included, a 1975 figure on the order of $420 billion could be regarded as a conservative estimate of the value of output of primary mineral processing plants. Moreover, it should be noted that the crude and processed mineral commodities constitute the overwhelmingly dominant share of the total raw material base for all manufacturing endeavors, as well as a significant requirement for the agricultural industries because they include fertilizers.

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 are provided for the world aggregate and for major individual geographic and economic areas.

The index for output of the extractive industry as a whole registered a 1.7% decline between 1974 and 1975; adjustments made in this index indicate that total world extractive industry output value increased 1.8% between 1973 and 1974 (revised from the 3.5% rise reported in the 1974 edition of this chapter). Thus, in terms of the index number, world extractive mineral industry output value in 1975 was below that of 1974 and about equal to that of 1973.

The value of output of the world coal industry went counter to the general trend of the extractive industries, registering a 2.1% increase between 1974 and 1975, a marked contrast to the 3.3% decline recorded for the petroleum and natural gas industry and the 2.8% decrease computed for the metals extractive industry. The increase noted for coal is a reflection of a shift back toward coal among major energy sources following sharp increases in world oil prices and instability of oil supplies for some nations owing to political rather than economic considerations.

Also noteworthy are the sharp differences between the index patterns for the centrally planned economy nations of Europe and those for the market economy nations. For the extractive industry index, as well as two of its three components that are shown, the centrally planned economy nations registered substantial gains between 1974 and 1975. (In the case of the third component, metals extraction, these nations did not register a decline.) Nearly all the market economy nations showed declines in all indexes except that for coal. Exceptions to this were metals extraction in Australia-New Zealand, petroleum and natural gas in market economy Europe (including the European Economic Community), petroleum and natural gas in Latin America, and total extractive industry in Australia-New Zealand.

As in the case of the extractive industries, the major sectors of processing industries that relate directly to mineral raw materials all showed declines in terms of total world output, as measured by the United Nations indexes reflecting worldwide industry. In the case of the processing industries, however, the decline in the world index was the result of shortfalls among only the developed market economy nations. Both the developing market economy nations and the centrally planned economy nations registered gains that, in part, compensated numerically for shortfalls in developed market economy countries. Clearly the general economic problems that affected the developed market economy nations were not as pronounced among developing market economy countries although they were reflected in lower levels of crude mineral production for export from the developing countries to developed countries, and thus had an impact on the economies of the developing nations. Moreover, there was only minimal effect of these general economic problems upon the centrally planned economy countries of Europe.

QUANTITATIVE COMMODITY OUTPUT

Total world production of 81 mineral commodities is given for the years 1973–75 in table 2.[3] Regional distribution of these same commodities for 1975 is given by major physical geographic area in table 3 and by economic group of nations in table 4. In addition, the statistical summary at the end of this chapter includes world output of selected major commodities by principal producing country for 1973–75.

The most prominent aspect of the data in table 2 is the vast number of commodities for which production declines were registered between 1974 and 1975—of the 81 commodities listed, 61, or over 75%, showed declines, with only 19 registering gains and 1 maintaining its 1974 production level. This was a reversal of the pat-

[3] The previous edition of this chapter covered only 71 commodities; additions in this edition are refined copper, smelter nickel, bentonite, fuller's earth, kaolin, sodium carbonate, sodium sulfate, carbon black, natural gas liquids, and refined petroleum.

tern between 1973 and 1974, when 57 commodities registered increases and 24 registered declines.

Nonfuel Mineral Commodities.—Of the 41 metallic mineral commodities listed in table 2, only 10 registered production increases between 1974 and 1975 and 31 showed declines. None of the major metals —iron, aluminum, copper, lead, and zinc— showed gains either in mine output or in production of ingot metal. Metal commodities registering increases were as follows: Beryl concentrate (2.8%), chromite (6.9%), mine cobalt (1.4%), manganese ore (7.3%), mine nickel (3.5%), smelter tin (0.7%), rutile titanium concentrate (6.0%), tungsten (1.4%), uranium (7.6%), and vanadium (12.9%). The fact that a number of ferroalloying metal minerals was included among the metals registering production increases did not alter the fact that total ferroalloy production declined 5.7%, a decrease only slightly smaller than those registered for pig iron and crude steel.

Among the 29 nonmetallic mineral commodities shown in table 2, only 4—barite, nitrogen fertilizers, sulfur from pyrite, and vermiculite—registered growth in output levels between 1974 and 1975. Most declines registered by the remaining 25 commodities were 5% or less, but there were exceptions, most notably the 46.7% fall in strontium mineral production, the 14.9% drop in output of talc and related materials, the 11% decline in gem diamond output, the 10.5% decline in gypsum output, and the 10.3% drop in feldspar output. Tables 34 to 51 in the statistical summary section of this chapter give output levels of selected major nonfuel mineral commodities (metals and nonmetals) by major producing country for 1975.

Mineral Fuel Commodities.—In 1975, world production of energy from all commercial sources (excluding wood, charcoal, bagasse, and animal dung, which are regarded as noncommercial sources) totaled 8,555 million tons of standard coal equivalent (SCE), almost 5.5% below the revised 1974 level of 8,602 million tons SCE, and only slightly above the revised 1973 level of 8,504 million tons SCE. The distribution of this energy production, by fuel source, is given in the following tabulation for 1973–75:

Energy source	Share of total energy producton [1] (percent)		
	1973	1974	1975
Coal (including lignite)	29.2	29.3	30.9
Petroleum	49.8	49.4	47.1
Natural gas	18.8	18.9	19.4
Hydro, geothermal, and nuclear electricity	2.2	2.4	2.6
Total	100.0	100.0	100.0

[1] Based on data in United Nations, World Energy Supplies, 1971–75. Statistical Papers, ser. J, No. 20, New York, 1977, p. 2. Figures for 1973 and 1974 differ from data published in previous editions of Minerals Yearbook owing to data changes in source publication.

The increased share of the total accounted for by coal, comparing the figures of 1973 with those of 1975, is notable; the share of total commercial energy derived from coal in 1973 was the lowest on record, and the share of total energy from oil in that year was the highest on record. The 19.4% of total commercial energy production accounted for by natural gas in 1975 was the highest share ever recorded for that commodity, and the 2.6% credited to hydro, geothermal, and nuclear energy for 1975 was also a record high for these primary electrical energy sources.

Of the 11 mineral fuel commodities reported in table 2, 6 showed declines between 1974 and 1975 and 5 registered gains, including all three types of coal (anthracite, bituminous and lignite), peat, and natural gas. Details on output of major fuels, by principal producing country are given in tables 52 to 56 in the statistical summary at the end of this chapter.

VALUE OF WORLD MINERAL PRODUCTION

General estimations regarding total world mineral output value in 1974 and 1975 appear in the first paragraphs of this production section and in the tabulation that accompanies them; no data are provided in this edition of the Minerals Yearbook on the subject of value of world mineral production on a country or a commodity basis. The source for this information, the French mineral industry publication *Annales des Mines,* publishes only on a 5-year cycle in this detail, the last year covered being 1973. For information on the 1973 distribution of world mineral output value by commodity and country and details on the methods used to extrapolate this data in aggregate to the present, the reader is referred to the corresponding section of the 1974 edition of Minerals in the World Economy.

TRADE

GENERAL TRENDS

The aggregate value of world mineral commodity trade rose to $322,871 million in 1974, the latest year for which reasonably comprehensive data are available. This represents a 108.9% increase over the value of world mineral commodity trade posted in 1973. Such a jump in the export value of mineral commodities is illustrative of the inflationary trend that accelerated toward yearend 1973, when prices of crude oil and refinery products were advanced excessively by a number of producing nations. Such fuels represent a very large portion of the value of all mineral commodities traded, with the mineral commodities share of all commodities traded jumping from 26.9% to 38.6%. In terms of actual dollar value, the increase represented an additional cost of $168,319 million to the consumer. The following tabulation gives 5 years' data on the estimated value of world trade in mineral commodities:

	Estimated value of all mineral commodities traded [1] (millions)	Increase from previous year (percent)	Mineral commodities share of all commodities traded (percent)
1970	r $83,558	r 17.4	26.8
1971 r	91,153	9.1	26.1
1972 r	106,405	16.7	25.6
1973 r	154,552	45.3	26.9
1974	322,871	108.9	38.6

r Revised.
[1] Value estimated from data on mineral commodities appearing in table 5, to which has 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 5, 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 5 represent about 81.5% of total mineral commodity trade.

The value of world trade in major mineral commodities from developing market economies increased substantially at the expense of that from developed and centrally planned economies. In contrast to previous years, the percentage distribution of export value of the various areas to the total also changed considerably, with developed areas falling nearly 11 percentage points from their 1973 share of the total.

COMMODITY GROUP TRADE PATTERNS

Table 5 gives the value of export trade in major mineral commodity groups for 1970–74, with the value of all commodities traded included for comparison. The distribution of the total export value by each of the major mineral groups is given in table 6, while table 7 gives the growth in value of each major mineral commodity group for each year, in comparison with the growth in value of all commodities traded. The value of mineral fuels was $170,120 million, 64.6% of the total value of all major mineral commodities traded. This represents a growth in value of 161.5% compared with that of 1973. Thus, fuels gained a significantly higher percentage of the value of world mineral trade, as well as a commanding growth rate. Mineral fuels made up $105,060 million of the $137,180 million increase realized by all major mineral commodity groups in 1974. The value of iron and steel world trade increased by $17,960 million, a rise of 63.1%. The total value for that commodity group is more than 230% of the 1972 level. Because of the dominant position held by mineral fuels, the percentage of the total accounted for by each of the remaining four major mineral commodity groups declined. Iron and steel's share declined for the fourth consecutive year to 17.7%, despite a 63.1% growth in value from 1973. Nonferrous metals' percentage of total mineral trade value fell to 9.6% from 13.7%, despite a 43.2% increase in value. Value of trade in ores, concentrates, and scrap accounted for 5.9% of the total, while crude nonmetals comprised only 2.2%. The growth in value of all major mineral commodity groups was 108.9%, compared with 45.1% growth in value of all commodities traded. The value of trade in mineral fuels comprised 20.4% of all commodities traded in 1974, compared with 11.3% in 1973.

REGIONAL TRADE PATTERNS

Table 8 gives the value of world trade of the aggregate of major mineral commodity groups in comparison with the value of all commodities traded for the countries and areas listed. Table 9 gives the origins and destinations of each of the major mineral commodity groups, and table 10 amplifies the previous data by listing the origins and destinations of the aggregate of those groupings. The following tabulation represents an analysis of the value of world mineral trade by developed, developing, and centrally planned economy countries in 1974, with each area's share of the world total in percent:

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	72,270	118,000	9,520	20	199,810
Developing	15,665	28,330	1,478	—23	45,450
To centrally planned economy countries	5,901	1,907	6,905	—23	14,690
Undistributed [2]	1,974	1,103	107	6	3,190
Total	95,810	149,340	18,010	—20	263,140
Share of world total (percent):					
To market economy countries:					
Developed	27.5	44.8	3.6	(3)	75.9
Developing	6.0	10.8	.6	(3)	17.4
To centrally planned economy countries	2.2	.7	2.6	(3)	5.5
Undistributed [2]	.8	.4	(3)	(3)	1.2
Total	36.5	56.7	6.8	(3)	100.00

[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 States, and Yugoslavia; centrally planned economy countries are Albania, Bulgaria, the 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.

Source: United Nations. Monthly Bulletin of Statistics. V. 30, No. 2, February 1976, pp. xxviii–xlii and No. 8, August 1976, pp. xxvii–xlv.

The value of mineral commodity exports from developing nations exceeded that from developed countries for the first time, rising to $149,340 million for a 180% increase. Previously, the export value from developing nations comprised 43% of the world total, but the year's increase gained for them 56.7%. The share of the total from developed nations declined to 36.5% from 47.2% despite a gain of $37,340 million in absolute terms. Centrally planned economies were up 46.4% in value of trade, but lost 3 percentage points in their share of the total. Developed nations witnessed a 174% increase in the value of major mineral commodities imported from developing nations. Thus, developed nations again accounted for approximately 76% of all world major mineral commodity trade.

In 1974, 31.5% of the value of all commodities exported consisted of major mineral commodities, compared with 21.6% in 1973. In the Near East, 95% of the value of exports consisted of mineral fuels, with the export value of that commodity group up 259%. With the exception of the Republic of South Africa, every area listed exhibited increases in terms of the aggregate value of major mineral commodities exported and in percent of total commodity exports accounted for by minerals. In examining the countries and areas listed with regard to imports, nearly all showed an increase in the value of major mineral commodity trade, as well as an increase in the percentage of all materials imported that were of a mineral nature. The sole exception was centrally planned economy countries of the Far East and South Asia, which declined to 23.1% from 25.4% in 1974, despite a gain of $488 million in the value of major mineral commodity imports. The value of such imports by the United States jumped 115%, outpacing the gain in value of exports of the same commodities and thus widening the trade deficit of that country.

The value of iron and steel exports from the countries and areas listed in table 9 increased considerably over that of 1974. In Japan, such exports more than doubled in value; in Europe, exports from members of the European Free Trade Association (EFTA) increased 45.7%. The value of iron and steel exports from the European Economic Community (EEC) was up 59.4% over that of 1973, and imports of mineral fuels increased from $23,460 million to $62,490 million. Overall, the centrally planned economy nations displayed more modest increases in the value of major mineral commodity group trade. The value of iron and steel exports to centrally planned economy countries of the Far East and South Asia exceeded $1 billion for the first time. The relatively low value of exports of mineral fuels from those countries in 1973 was followed by a nearly eightfold increase in value in 1974, presumably because of increased exports of higher priced fuels to gain additional exchange in foreign currency.

In terms of percentage increase, the value of trade in major mineral commodities to Latin America was 204.4% above the 1973 level. Such increases are particularly severe for developing nations confronted with sudden excessive increases in fuel prices along with runaway inflation because of limited resources. The Near East experienced a 180.2% increase in value of trade in major mineral commodities, with the Republic of South Africa close behind at 170.5%. The largest portion of Latin American trade was with the United States and Canada. In most cases, the countries of the EEC and the Near East were the primary exporters to the rest of the world in terms of value of trade in major mineral commodities. By examination of the totals credited to each area or country, the relative export-import position for that region can be determined. Exports of $335 million for the Republic of South Africa, for instance, compared with imports of $1,777 million, make that country a net importer.

CONSUMPTION

NONFUEL MINERAL COMMODITIES

The inflationary excesses of 1973 and 1974, spurred by higher fuel prices, led to severely dampened demand and, consequently, recession in 1975, with consumption of most mineral and mineral-related commodities for which there is information down from that of the previous year. Higher costs for the extraction of basic raw materials resulted in higher prices, with the result that willingness to maintain production levels decreased as demand fell off, driving down consumption. The iron and steel industry, historically an indicator of overall mineral industry direction, experienced significant declines in two primary sectors.

World consumption of iron ore declined 12.3%, compared with a slight 1974 increase of 2.3%. Table 11 lists consumption by selected major countries for the 3-year period 1973–75. Market economy countries, particularly developed economies had severe declines in iron ore consumption.

Members of the EEC had a 25.1% decline, equivalent to 50.3 million tons. France and West Germany were hardest hit, down 32.7% and 25.4%, respectively. French consumption of iron ore fell 16.9 million tons, with West Germany's decrease in consumption, close behind at 16.7 million tons. Overall, EFTA consumption was up 29.1%; however, this is calculated on the basis of apparent consumption for Sweden, which was determined to be up 94.1%, or 4.8 million tons. U.S. consumption was down 24.5 million tons, a decline of 17.5%. Market conditions favored Japanese steel production in 1975, and although demand was down, the decline in iron ore consumption was not as severe as in other developed nations, falling only 2.1% or 2.6 million tons. As in past years, centrally planned economy countries generally recorded rising consumption levels, although at modest rates. Consumption in the U.S.S.R., the largest consumer, was up 3.2%.

Iron and steel scrap consumption patterns paralleled that for iron ore. World consumption fell 13.5%, with all regions or designated economic groupings showing declines, except Latin America and centrally planned economy countries of Europe. Brazil and Mexico continued to expand consumption of iron and steel scrap, together utilizing an additional 862,000 tons of scrap. Japanese consumption fell 11.9 million tons, and U.S. consumption was down 22% or 21 million tons. Denmark was the only EEC member with increased iron and steel scrap consumption. Revisions in data for the United Kingdom show that consumption has declined for 3 consecutive years from the 1972 record high. Centrally planned economy countries of Europe all registered higher iron and steel scrap consumption levels, as did India and the Republic of South Africa. It should be noted that table 12 has been revised and updated to cover 5 years' data (1971–75) and include 11 additional nations.

Information is not available on most mineral commodities regarding world consumption. However, table 13 lists consumption of five major nonferrous metals for a 3-year period. It is apparent from the table that, in the face of a general worldwide recession, basic commodities are heavily affected. In 1975, the five metals listed had declines in consumption ranging from 11.6% for copper to 15.6% for aluminum. Consumption of aluminum, an energy-intensive industry, was down 2.2 million tons. Consumption of copper was down nearly 1 million tons, while lead consumption fell 12.6% to slightly below the 1971 level. In the case of zinc, consumption was off nearly 1 million tons from the 1973 high. The 14.1% decline in tin use was second only to that of aluminum, and brought that metal's consumption down to the 1970 level.

Consumption of nonmetals also declined. World consumption of sulfur declined from 34 million tons in 1974 to 30.8 million tons in 1975, a drop of 9.4%. In the case of major commercial fertilizers, only consumption of nitrogen was up slightly for the 1974–75 fertilizer year (July 1, 1974, to June 30, 1975). That commodity's consumption rose from 38.9 million tons to 39 million tons. Consumption of phosphate fertilizers (P_2O_5 content) was down from 25.5 million tons to 24.1 million tons, a decline of 5.5%. Potash fertilizer consumption (K_2O equivalent) also decreased, falling 900,000 tons to 20 million tons.[4]

MINERAL FUEL COMMODITIES

World consumption of energy, by energy source, is given in table 14, covering the 6-year period 1970–75 in terms of million tons SCE. Total world energy consumption was up 1.1%, only slightly higher than the 0.8% increase in 1974. This compares with 5.2% in 1972 and 5% in 1973. Per capita energy consumption declined for the second consecutive year, falling 0.6% in 1975.

The differentiation of total energy consumed, by energy source, continued to follow the trends established in 1974. The share of total consumption that was liquid fuel declined again to 44% from 44.9% in 1974. Additionally, the total consumption of liquid fuels fell 1%. Consumption of solid fuels was up 3.2%, with the proportion of total energy consumption made up of solid fuels rising to 32.7% from 32.1% in 1974. While such percentage differences appear minor, they indicate the change in energy source mix from what dominated the previous 10 years. Natural gas consumption rose 1.4% to 20.4% of

[4] British Sulphur Corp. Ltd. (London). Statistical Supplement No. 14. November–December 1976, 20 pp.

total energy consumption. This increase was due in part to increased prices and demand, which made feasible the marketing of gas that would normally have been flared or vented. Although having the smallest share of total energy consumed at 2.8%, world consumption of hydro, nuclear, and imported electricity had the highest increase at 6.7% over consumption in 1974.

Regionally, centrally planned economy countries increased aggregate energy consumption 6.8%, topping North America for the first time. Consumption of individual energy sources by centrally planned economy nations increased in 1975, except for that of hydro, nuclear, and imported electricity, which was unchanged. Consumption of liquid fuels was up 8.8%, while that of natural gas increased 12.5%, mainly imported from Europe. Solid fuels consumption for that sector rose 4.1%, compared with 2.3% for market economy nations. Per capita consumption for centrally planned economies was up 5.2%, compared with a decline of 3.3% for market economy countries. Coal was regaining its importance among industrialized market economy nations; petroleum and natural gas were particularly important for centrally planned economies, especially those of Europe, which currently have access to large quantities from the U.S.S.R. through massive pipeline systems. Even Western European reliance on U.S.S.R. liquid fuels was increasing as a percent of total energy consumed by that region. Per capita consumption in North America fell 5.8% since 1973, while that of Western Europe declined 6.1% for that same period. Aggregate energy consumption by developing market economies increased generally, with the exception of Caribbean America. These same regions also tended to show improvement in aggregate and per capita energy consumption, with Africa, Near East, Far East, and Oceania aggregate consumption up 11.3%, 5.8%, 0.3%, and 3.1%, respectively.

INVESTMENT

Worldwide investment in the mineral industry increased in 1975, despite the recession that began at yearend 1974. Information available on general industry developments show an upward trend, particularly for petroleum industry expenses. Steel industry investments declined in the EEC, the only significant reduction in that sector in 1974. U.S. worldwide investment in the mineral industry was up substantially, even in the face of declining earnings and income. As in past years, comprehensive information on investment by centrally planned economies is not available, and assessment of that area's investment picture can only be construed by piecing together press announcements and proclamations made by individual governments. In the case of European centrally planned economy countries, substantial investment continued in pipeline and pumping facilities, as well as refinery construction or expansion.

Table 15 gives annual investment expenditures in the steel industry for selected countries for 1973 and 1974. The United States again increased investment in that sector 50.3%, or $704 million. Japanese investment expenditures showed a reverse in the downward trend of the past 3 years, rising 37.5% or $762 million. Steel industry investments by the nine nations making up the EEC fell 7.6% or $229 million.

Investment expenditures by market economy countries in the petroleum industry are given by geographic area in table 16, and by industry sector and exploration expense in table 17. The following tabulation gives a percentage breakdown of such expenditures by the countries and areas listed, for 1974 and 1975:

Area	Percent of total	
	1974	1975
United States	38.7	36.4
Other Western Hemisphere	11.6	11.8
Western Europe	15.5	18.0
Africa	3.0	3.6
Near East	4.0	4.0
Far East	8.2	8.8
Unspecified	19.0	17.4
Total	100.0	100.0

The United States continued to dominate the total at 36.4%, down slightly from the 1974 level. Investment expenditures in Western Europe, particularly as affected by North Sea developments, rose to 18% of the total. The remaining areas listed increased their percentage share of the total, except for "Unspecified" areas, which fell to 17.4%, and the Near East, which remained unchanged. As in the past year, capital expenditures in terms of actual dollar value increased for every area listed in table 17. While exploration expenses were up 6.4% for the world, several of the areas listed showed declines. Capital expenditures for petroleum in the United States reached an alltime high of $17,725 million, up 6.6%. Those for Western Europe were up 30.8%, or $2,130 million, one of the largest yearly increases recorded. Capital expenditures in the Near East and Far East were up 14.4% and 23.7%, respectively. However, Africa had the largest percentage gain at 37.9%, which in terms of dollar value was $460 million. Overall petroleum capital expenditures were up 13.6%, or $5,925 million. Examination of market economy petroleum industry capital expenditures by industry sector shows expenditures for production of crude oil and natural gas comprising the largest portion of total capital expenditures at 36.9%. This sector declined slightly from 1974, but the loss was more than made up by expenditures for pipelines, refineries, and chemical plants. The marketing sector again declined, with all other sectors registering an increase. Expenditures for pipelines jumped 143.7%, or $3,535 million, the largest increase of any sector on both a percentage and dollar basis.

Detailed U.S. investment in the world mining, smelting, refining, and petroleum industries is given by geographic area in table 18. Overall, value of U.S. investment in petroleum was up 15.3% in 1975, or $4,611 million, despite declines of 57.9% and 68.8% in earnings and income, respectively. Value of investment in the mining, smelting, and refining industries was up 13.1% compared with that of 1974, again despite 21.7% and 35% decreases in earnings and income, respectively. Capital outflows to Peru increased, where a major copper expansion project was underway. The additional value accounted for most of the increased investment in Latin America and other Western Hemisphere countries in 1975. In petroleum investment, Europe made up 32.7% of the total, up 14.3% from that of 1974. Investment in Far East and Pacific areas was up 31.6%, and Near East investment was up 127.7%. The sharp decline in adjusted earnings and income of petroleum affiliates was due to substantial tax and royalty increases by host countries. In the Near East, for example, earnings fell from $8,431 million to $2,364 million, a decline of $6,067 million, or 72%.

TRANSPORTATION

MARINE TRANSPORT

Tankers, bulk carriers, and freighters are the primary oceangoing vessels for transport of mineral commodities. The number, gross tonnage, and deadweight tonnage of these vessels, as reported by the U.S. Maritime Commission, are given in table 19. The data listed therein are not completely comparable to those supplied in previous years owing to the inclusion of refrigerated freighters in the freighter category, and their exclusion from vessels classified as "Other." In terms of quantity, such vessels numbered approximately 1,000 in 1974, with a combined gross tonnage of 5,433,000 tons and a combined deadweight tonnage of 5,794,000 tons. When considering seaborne traffic, it must be remembered that vessels in each of the classes listed may not be involved wholly or even partly in transport of mineral commodities. Tankers generally move petroleum and refinery products, but also included in the listing are wine, molasses, and whaling tankers. Bulk carriers move agricultural products in addition to fertilizer and crude minerals, while freighters, because of their highly evolved technical nature, move numerous and diverse materials.

The volume of trade over the 5-year period 1971–75, in terms of loadings and unloadings of tanker and dry cargo, is given in table 20. Tables 21 and 22 give a regional breakdown of such loadings and and unloadings, by cargo type. Overall, loadings of tanker cargo declined 3.7% in 1975, while unloadings were down 8.5%.

In the case of tanker loadings, the tonnages shown represent 2 consecutive years of decline from 1973, while dry cargo tonnage declined for the first time since this series of tables was begun in 1971.

Regionally, examination of unloadings of tanker cargo by developed market economies indicates a 9.9% decline from those of 1974. Most conspicuous among the declining developed market economy nations were Western European countries and the United States, down 11.6% and 9.3%, respectively; unloadings by Japan declined 7.8%. Loadings by developing market economies, which include the Near East and North Africa, were down 4.2%. Near East loadings fell 70 million tons, and Venezuelan loadings fell 25 million tons. Unloadings of tanker cargo remained unchanged for centrally planned economy countries, but loadings were up 12.2% to 83 million tons. Unloadings of dry cargo by developed market economies declined for the first time, by 5.7% or 64 million tons compared with those of 1974. This was in contrast to unloadings in developing and centrally planned economies, which were up 8.7% and 23.7%, respectively. As in the case of tanker unloadings, dry cargo unloadings were most heavily reduced by Western Europe, which were down 53 million tons. The United States maintained an approximate 6% increase in dry cargo unloadings. The cumulative effect of the downturn in many developed economies is evident in the tonnage of loadings of dry cargo attributed to Western Europe, which declined 49 million tons. Loadings of dry cargo in developing market economies as a whole declined 41 million tons, with most of the decline experienced by countries listed as "Other."

The percentage of such loadings and unloadings that were mineral commodities is indicated by an examination of traffic transiting the Panama and Suez Canals. In 1975, 62.5% of all traffic transiting the Panama Canal was mineral commodities; for the 6-month operation period of the Suez Canal, 26.1% was of mineral origin. Considering that most tanker and bulk carrier traffic bypasses the canals because of capacity limitations, it may be assumed that an even larger quantity of total seaborne traffic is mineral related.

The total merchant fleet amounted to 22,872 vessels in 1975, with a combined gross tonnage of 333,042,000 tons and a combined deadweight tonnage of 556,572,000 tons. Despite worldwide recession and the reduction in trade, the number of vessels increased 1.9%, gross tonnage was up 8.7%, and deadweight tonnage, 10.6%, compared with 1974 figures. The slight change in number of vessels in the fleet compared with extensive increases in gross weight and deadweight tonnages illustrates the increase in average size of the vessels. An additional 53,224,000 deadweight tons was added to the fleet from a net change of 423 vessels, with nearly 77% of the additional tonnage in tankers.

Bulk Carriers.—In 1975, the world bulk carrier fleet increased by 197 vessels, or 4.8%, compared with an increase of 275 vessels in 1974. Gross tonnage of all bulk carriers increased 7.1%, compared with 10.3% the previous year, while deadweight tonnage was up 7.8%, compared with 10.4% in 1974. The average size of the additional vessels was 54,888 deadweight tons, compared with 47,735 tons for the 275 vessels added in 1974. Overall, the average deadweight tonnage of all bulk carriers increased from 34,176 tons in 1974 to 35,131 tons in 1975. The following tabulation lists the leading countries with bulk carrier fleets, in order of aggregate deadweight tonnage:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Liberia	925	37,243
Japan	535	21,270
Norway	318	16,696
United Kingdom	343	14,508
Greece	483	13,205
Italy	151	6,541
Sweden	88	4,785
Panama	224	4,515
Germany, West	79	3,993
India	76	3,129
France	57	2,405
Spain	61	1,943
U.S.S.R	148	1,652
Poland	75	1,613
Singapore	44	1,613
Brazil	35	1,304
Other	630	13,665
Total	4,272	150,080

Freighters.—The number of freighters (including refrigerated freighters) in the world merchant fleet in 1975 amounted to 12,575. Advances in technology and application of these advances in shipyard construction have led to an extremely varied class of vessels. Freighters consist of general cargo carriers, full containerships, partial containerships, roll-on/roll-off vessels, and the newest design, barge carriers. The U.S. freighter fleet alone cannot be considered solely in terms of numbers of vessels, because numerous war-built vessels have been scrapped, with a resultant decline in the quantity of vessels over the past 10 years. The average age of the U.S. fleet has declined since 1968, with newer vessels having nearly a 20% increase in average speed and a 40% increase in deadweight tonnage. Because of the inseparability of refrigerated freighters from the class of freighters, the overall statistics are not readily comparable to previous years' data. The following tabulation lists the principal nations of registry of freighters, in order of their share of aggregate deadweight tonnage for 1975:

Country	Number of vessels	Deadweight tonnage (thousand tons)
U.S.S.R	1,706	10,499
Greece	918	8,653
Japan	954	7,945
United Kingdom	746	7,322
Panama	1,060	7,187
United States	511	7,051
Liberia	586	5,814
Germany, West	445	3,822
Cyprus	472	3,267
Norway	309	2,559
Netherlands	318	2,452
China, People's Republic of	261	2,351
Other	4,289	32,326
Total	12,575	101,248

Tankers.—In 1975, the world tanker fleet increased by 190 vessels, compared with an increase of 308 vessels between 1973 and 1974. The additional vessels resulted in a 14.2% increase in gross tonnage and a 15.6% increase in deadweight tonnage. Average tanker size increased once again, reaching 56,900 deadweight tons compared with 51,053 deadweight tons in 1974. Average gross tonnage of vessels rose from 28,002 tons to 30,829 tons. Table 23 lists the distribution of world oil tanker tonnage, by size group, for 1975, with 1966 included for comparison. In that 9-year period, total world tanker deadweight tonnage increased nearly threefold. The dramatic change in the composition of the fleet is evident when one compares the tonnage of vessels of 125,000 deadweight tons and over for the 2 years. In 1966, slightly more than 1% was of that size group, while in 1975, 58.2% of the fleet was in excess of 125,000 deadweight tons. As in 1974, tankers in the 205,000- to 285,000-ton class accounted for the largest percentage of tanker tonnage afloat at 43.2%, up from 41.2% in 1974. However, only 29.6% of new tankers planned or underway in 1975 were in this class, contrasted with 35.2% the previous year. Of the vessels under construction or on order by yearend 1975, 36.6% were to be 285,000 deadweight tons and over. Additionally, total tonnage of new vessel construction in progress or on order was 88.5 million tons, compared with 164.4 million tons a year earlier, a decline of 46.2%. By yearend 1975, 53.3% of the total world tanker tonnage had been added during the past 5 years. The following tabulation gives the percentage of total tonnage, in terms of year of completion, of vessels classified as tankers in 1974 and 1975:

Year of completion	Percent of total tonnage	
	1974	1975
Up to yearend 1945	1.5	1.1
1946–50	.6	.3
1951–55	4.1	2.7
1956–60	11.2	8.8
1961–65	13.5	11.3
1966–70	25.7	22.5
1971–75	43.4	53.3

Source: British Petroleum Co. Ltd. BP Statistical Review of the World Oil Industry, 1974 and 1975. Bayard Press, London, 1974, 1975.

Liberia remained the leading country of registry of vessels classed as tankers, with an increase of 15,651,000 tons from 1974. The following tabulation breaks down the world tanker fleet by flag of registry, in order of national aggregate deadweight tonnage, in 1975:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Liberia	1,014	89,470
Japan	531	33,950
United Kingdom	459	32,869
Norway	332	28,467
Greece	345	15,557
France	154	13,190
Panama	238	10,224
United States	250	9,475
Italy	236	7,953
Sweden	79	6,524
U.S.S.R	462	5,861
Germany, West	83	5,627
Spain	114	5,257
Netherlands	88	5,074
Denmark	59	4,594
Other	867	28,125
Total	5,311	302,217

OCEAN FREIGHT RATES

The economic picture of the world in 1975 as it affected the mineral commodity situation can be clearly illustrated by examining the freight-rate situation of one significant aspect of the transportation sector in the world economy. Indexes of ocean freight rates by trip charter and time charter, vessel type, and tonnage for selected countries are given in table 24. From the table it is evident that ocean freight rates plummeted in 1975. Even rates of centrally planned economy countries for the limited tanker classes that are available fell considerably, in contrast to previous years. The annual average index of freight rates fell for every type and class of vessel listed in table 24, with most of the decline occurring within the first quarter of 1975. Rates were driven down sharply and persistently for a variety of reasons, including high prices for mineral fuels, particularly crude oil and refinery products; the U.S. and world recessions, which were partly a consequence of the end of the Vietnam conflict; and a surfeit of new shipping tonnage, which has virtually replaced and superceded earlier record tonnages. Rates for Norwegian tankers on trip charter fell 63% for vessels over 150,000 deadweight tons, with rates for other Norwegian tanker classes falling 43% to 50%. Rates for United Kingdom tankers on time charter were down 24% to 32%, with dry cargo rates following the same pattern. As in the case of tankers, larger vessels transporting dry cargo showed the greatest decline, with United Kingdom time charter dry cargo vessels over 40,000 deadweight tons falling 64.3%.

PANAMA AND SUEZ CANALS

The number of transits and quantity of cargo moved through the Panama Canal decreased 3.5% and 6%, respectively, in 1975. The decline from the record tonnage set in 1974 was 9,189,000 tons to 142,893,000 tons. The reduction in traffic through the Canal was attributed to various causes, primarily inflation and simultaneous recession, but also to subsidence of a portion of one of the waterway's banks. The slide resulted in temporary closure of the entire canal, and the utilization of one-way traffic until March 21, 1975. Significantly, however, despite the decline in total tonnage moved, the quantity of mineral commodities moved rose 1.8% from fiscal 1974. Additionally, the percentage of total cargo moved that was mineral commodity increased to 62.5% from 57.7% the previous year. The following tabulation summarizes mineral commodity movement in comparison with other Panama Canal activity:

	Fiscal year		
	1973	1974	1975
Number of transits:			
Commercial ocean traffic	13,841	14,033	13,609
Other traffic	1,268	1,236	1,126
Total	15,109	15,269	14,735
Cargo moved (thousand metric tons):			
Commercial ocean traffic:			
Mineral commodities	r 72,025	r 87,696	89,250
Other commodities	r 56,103	r 62,585	53,100
Subtotal	r 128,128	r 150,281	142,350
Other traffic, all commodities	1,481	1,801	543
Total cargo moved	r 129,609	r 152,082	142,893

r Revised.

Modifications in the type and nature of vessels transiting the Panama Canal were again evident for the most recent year of operation. While transits and tonnage were down, average ship size continued to increase, with oceangoing commercial vessels averaging 9,931 net tons, compared with 9,679 tons in 1974. The trend continued toward replacement of smaller vessels in Canal trade by larger specialized vessels, primarily bulk carriers and container ships. Table 25 gives commercial ocean traffic through the Panama Canal in terms of number of transits and total tonnage moved, by vessel type, for 1974 and 1975. In terms of cargo weight, dry bulk carriers accounted for 56.4% of the total moved, followed by tankers at 17.6% and general cargo ships at 16.1%. Nearly 60% of the total cargo moved through the Canal was Pacific bound, again with bulk carriers and tankers making up most of the tonnage. In terms of number of transits, general cargo ships maintained the lead at 29%, followed closely by dry bulk carriers at 27.6%.

Table 26 gives 3 years' data on the quantity of individual mineral commodities shipped through the Panama Canal by direction of movement. While over 64% of the tonnage moved was Pacific bound, the ranking by weight of the individual mineral commodities changed. Coal and coke movement topped the list at 26,725,000 tons, exceeding crude petroleum and refinery products for the first time since 1971. Most of the coal and coke was Pacific bound, with 92% of that amount destined for Japan in the wake of high steel demand for export from that country. The reduction in Canadian and Australian coal and coke shipments to Japan and the decline in U.S. and European shipments of iron and steel semimanufactures are believed to have led to such change in the pattern of mineral commodity movement through the Canal. The tonnage of crude petroleum and refinery products was down 25.2% from that of 1974, partly from the reasons cited earlier, but also because of damage suffered by the trans-Andean pipeline. The pipeline supplies Ecuadorian crude oil to the El Balao shipping terminal near Esmeraldos for later shipment through the Panama Canal. The disruption was principally responsible for the 58.5% fall-off in crude oil tonnage from Pacific to Atlantic via the Canal. Atlantic bound iron ore shipments were up 38%, or 906,000 tons over those of 1974, while iron and steel semimanufactures increased by 2,839,000 tons, a 41.5% rise over the previous year's total from Pacific to Atlantic. Bauxite and alumina shipments continued the decline begun in 1972, having decreased 711,000 tons since that date. Other high-volume mineral commodities include phosphatic fertilizer, up 3%, sulfur, down 4.7%, unspecified ores and concentrates, up 2.7% and zinc ore and concentrate, down 13.8% to 852,000 tons. Shipment of copper ores and concentrates fell sharply 22.4% or 158,000 tons from the 1974 level.

On June 5, 1975, the Suez Canal opened officially for the first time since its closure in the 1967 Arab-Israeli conflict. The Canal is a major trade route for European and Asian seaborne traffic, and the reopening considerably reduces the distance of three major transport routes. Preliminary data indicate that considerable capacity of the Suez Canal is yet to be utilized, and while available information does not make the Suez Canal operation readily comparable to the Panama Canal, the following tabulation gives a record of the level of activity for the 6-month operation period in 1975:

Number of transits:	
Commercial ocean traffic	4,577
Other traffic	50
Total	4,627
Cargo moved, commercial ocean traffic (thousand metric tons):	
Mineral commodities	15,048
Other commodities	42,566
Total	57,614

Mineral commodity movement accounted for 26.1% of total cargo transiting the Suez Canal. Table 27 lists the number of commercial transits, by vessel type, whether in ballast or laden, through the Suez Canal. General cargo ships led with 75.9% of total transits, with tankers second at 12.4%. South-bound traffic accounted for 55.4% of total traffic transiting the Canal. Table 28 lists the movement of mineral commodities through the Suez Canal, by commodity type and direction of movement (southbound or northbound) for the first 6 months of operation. Crude oil and refinery products comprised 44.1% of mineral commodity tonnage, followed by unclassified fertilizers at 13% and cement at 12.6%. As was the case with number of transits, southbound movement of mineral commodities exceeded northbound, with 53.9% of the total. Of the southbound movement of mineral commodities, most was accounted for by fertilizer material and crude petroleum and refinery products. Northbound cargo movements are listed for various mineral commodities. However, it should be noted that, in the case of metals, in several instances the tonnage of ore and concentrate moved is reported with the quantity of metal moved. Northbound movement of iron ore was 836,000 tons, or nearly 50% of all ores and metals transiting in that direction.

PIPELINES

In 1975, an estimated 100,000 miles of pipeline was planned or under construction around the world. Nearly 45% of the total was gas pipelines, 26% was crude oil lines, and 23% was product lines; the remaining 5,600 miles was slurry pipeline. By far, the largest portion of the total was in the planning or proposal stage, with about 20,000 miles actually underway or in some stage of completion.

Pipeline activity in the United Kingdom and Ireland, centered primarily in the North Sea area where over 400 miles of undersea pipelines was to be laid in 1975, amounted to 1,260 miles planned or under construction. The deepest large-diameter undersea pipeline yet attempted, a 36-inch, 94-mile line extending from Firth's Voe in the Shetland Islands to the Brent, Cormorant, Dunlin, Houlton, and Thistle Fields in the North Sea, was 50% completed. Delivery capacity was to be 1 million barrels per day, equivalent to nearly one-half of current United Kingdom consumption. Western Europe, including Scandinavian countries, had 6,700 miles of pipeline planned or under construction, with approximately 3,200 miles as gaslines. Construction of the much-discussed trans-Mediterranean gasline continued, which was to extend 1,550 miles from Algeria to Italy. Contracts were let for the design and engineering of the 370-mile link from the Hassi R'Mel gasfield to the Algerian-Tunisian border. The first undersea stretch is currently being laid across the northern approaches of the Straits of Messina. Though only 2.5 miles wide, five separate lines are being laid for greater flexibility and security along a 9-mile course designed to avoid seabed problems. Construction on the 36-inch, 270-mile gasline from Ekofisk to Emden, West Germany, continued through 1975, despite a projected completion date for late that year. An estimated 12,820 miles of pipeline was planned for the U.S.S.R., the People's Republic of China, and the Eastern European countries, with 6,985 miles as crude oil lines and 5,552 miles as gaslines. In China, a 270-mile stretch of crude oil line from Chinhuangtao to Peking was completed. This section constitutes a significant portion of the 935-mile pipeline from the Taching oilfields in the northeast of the country. Construction was begun on the Adriatic pipeline to supply crude oil to inland refineries in Yugoslavia, Hungary, and Czechoslovakia. Yugoslavia was expanding its inland refinery capacity significantly, and crude oil landed at the planned ocean terminal at Omisalj will be piped through 105 miles of 36-inch pipeline eastward to Sisak. From there a 38-inch, 63-mile branch line to Gola, with further extensions into Hungary and Czechoslovakia, will be constructed. A 245-mile branch will also be laid eastward to refineries at Bosanski Brod, Novi Sad, and Pancevo.

In the Near East, 12,000 miles of pipeline was planned or under development. Iraq, accounting for 3,100 miles of the total, currently has the 608-mile Iraq-Turkey crude oil line underway. Contracts were finally awarded for the 40-inch crude line from Kirkuk in northern Iraq to the Turkish port of Dortyol on the Mediterranean coast. Completion was scheduled for early 1977 with an initial capacity of 500,000 barrels per day and a final capacity of 700,000 barrels per day. In Iran, separate 42-inch-diameter crude oil lines and gaslines are planned to cover the 1,000 miles between southern Iran and Iskenderum.

Far East pipeline developments were generally uncertain due to political circumstances. In total, 5,000 miles were slated for construction in that region, with India and Pakistan having major projects underway. In India, construction of 900 miles of 18-, 24-, and 30-inch crude oil lines in the Gulf of Kutch continued, while Pakistan's major task, the 18-inch, 300-mile Sui-to-Karachi gasline proceeded without abatement. In Australia, where pipeline activity was expected to grow, the 34-inch, 840-mile line from Moamba to Sydney was underway, with 1,300 miles of gasline, 713 miles of product line, and 480 miles of slurry line also planned for that country.

Canada and the United States had nearly 42,000 miles of all types of pipeline planned or underway. In the United States alone, of the 22,500 miles of such pipeline listed, 10,594 miles was for gas transmission, and half of that involved natural gas from Alaska and/or the Canadian Arctic. Study was underway for a trans-U.S. pipeline for handling crude oil from the trans-Alaska pipeline when it reached the west coast. The most likely line at this stage is from the Pacific Northwest to the Middle West crude oil refineries and industries. Another development of the mineral transportation sector in the United

States was a proposal for a coal slurry pipeline from the Powder River Basin to the Texas gulf coast. It would be a 36- to 40-inch-diameter line extending 1,260 miles, with a throughput of 22 million to 29 million tons per year.

A total of 11,000 miles of pipeline was planned or underway in Central and South America, with about 6,000 miles consisting of natural gas lines. In Ecuador, crude oil exports were halted temporarily as heavy rains and landslides damaged the trans-Andean pipeline in March. A slurry line was planned in Brazil to carry iron ore to new ocean-shipping facilities. It is to be a 20-inch-diameter, 250-mile-long pipeline with a throughput capacity of 7 million tons per year. Two mountain ranges must be crossed with a maximum elevation of 3,855 feet.

PRICES

In 1975, inflation and the high cost of fuel dampened demand for many mineral and metal commodities. The excessive cost of many raw materials and the high interest on loans tended to suppress the housing industry in many developed countries, reducing consumption of metals and industrial minerals. The pricing boom of 1974 lasted until mid-1975, during which time many industries scrambled to absorb available stocks and supplies of raw materials. Comprehensive pricing data on large-volume materials are lacking, but information on several of the major nonferrous metals reveals that prices of most of them had declined by yearend 1975, several significantly. Only in the cases of aluminum and zinc were price increases sustained.

Tables 29, 30, and 31 give monthly and annual average prices of major nonferrous metals in the United States, the United Kingdom, and Canada. Aluminum prices in the United States and the United Kingdom increased 16.6% and 13.8%, respectively, in 1975. Prices in the United States showed a slight increase at yearend, while in the United Kingdom the price showed a general decline from May to December, when a modest rise occurred. Zinc prices in the United States reached a peak price in January of 39.153 cents per pound, with the year's low occurring in September, only 0.267 cents below the January level. The annual increase was 8.4%, compared with a 5.8% increase on the Canadian market, where zinc prices were also very stable. Only 1.460 cents separated the January high from the August low on that market. Copper prices declined 17.1% on the U.S. market, 39.7% in the United Kingdom, and 21.0% in Canada. U.S. monthly prices declined steadily for the first 7 months of 1975, then rose modestly to remain at 63.165 cents per pound for the rest of the year. Copper prices in the United Kingdom were hardest hit as they were at a low annual average price of 93.097 cents per pound in 1974. The Canadian market was much less erratic, with the largest drop, 5.772 cents, occurring between January and February. Lead prices in the United Kingdom fell 30.3%, while U.S. and Canadian prices were down 4.5% and 4.0%, respectively. The U.S. price of lead remained at 24.500 cents per pound from June 1974 through April 1975, before falling to a low of 19.000 cents per pound in June and July. Canadian lead prices followed a similar trend, though at slightly lower levels. In the United Kingdom, lead prices fluctuated for 8 months before a definitive downward trend carried the price to a low of 15.098 cents per pound in December. The annual average per pound price of tin fell 56.448 cents in the United States and 59.764 cents in the United Kingdom. In the case of the latter, the decline was steady throughout the year, except for a mild rally in June. U.S. prices declined from February through October, increased slightly in November, then declined to the year's low of 303.071 cents per pound in December, still well ahead of the 1973 level. Silver price movements were relatively similar for the United States and the United Kingdom, declining about 6% at nearly equivalent prices, while Canadian prices were down 4.2% compared with those of 1974.

A general indication of price movements for basic crude mineral commodities in world trade is illustrated in table 32. Overall, crude mineral prices were up 4.4% from those of 1974, based on the change reported in the export price index. Declines were recorded for three consecutive quarters, but a jump of 7.7% took place in the fourth quarter. A similar pattern held for fuels, with an annual average index up 1.9%, but with the fourth quarter index up 8.8% over that of the previous quarter. The export price index for metal ores was up 14.3%, all of which occurred between the final quarter of 1974 and March 1975.

The distribution of export price indexes by developed and developing market economies is reported in table 33. The index of all minerals for developing nations was up 2.9%, while for developed nations an increase of 9.9% took place, though from a considerably lower base. For both areas, increases were recorded in the last quarter from a general yearly decline. The export price index for nonferrous base metals fell 16.1% and 31.9% for developed and developing areas, respectively. For both areas, the decline was persistent throughout the year, with the exception of a leveling off of the index at 123 in the third and fourth quarters for developed areas.

STATISTICAL SUMMARY OF WORLD PRODUCTION AND TRADE OF MAJOR MINERAL COMMODITIES

The final 36 tables of this chapter (tables 34 to 69) 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 1967–74 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 mineral commodities covered in greater detail on a commodity basis in individual chapters of Volume I of the 1975 Minerals Yearbook and on a country basis in the balance of Volume III.

The data presented here on production (tables 34 to 56) in most instances correspond directly to the individual commodity world production tables appearing in Volume I of the 1975 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 either a commodity chapter or a country chapter subsequent to the completion of the other chapter. In most cases, country chapters were prepared later than commodity chapters and should be regarded as more reliable.

The number of commodities covered by these summary tables has been increased by five in this edition. Four tables have been added to provide coverage of all minerals that rank high in terms of value of world output, on the basis of data in the *Annales des Mines* study on value of world mineral production,[5] referred to previously under production. With the addition of tables on mine production of gold, nickel and diamond, and a table on natural gas liquids plant production, the set of summary commodity production tables in this chapter now includes all of the top 16 crude mineral commodities (ranked on a value of world output basis); in descending order of 1973 value these are petroleum, anthracite and bituminous coal (taken together), natural gas, copper, iron, gold, lignite coal, natural gas liquids, zinc, nickel, lead, salt, potash, diamond, tin, and phosphates. Additionally, bauxite, sulfur (including pyrite-derived sulfur), and manganese are covered among crude mineral products because of the large volume of production.

The set of summary production tables in this chapter also includes three major downstream products obtained from listed crude minerals—aluminum metal, steel, and refined oil (the last being the fifth new production table added to this edition)—and two major downstream products for which comprehensive world production data on crude output are not available—cement and nitrogen fertilizers. The first three of these mineral product output tables are included chiefly because of the substantial difference in ranking of producing nations between the mine production stage and the processing stage, and the last two being included simply because of the lack of comprehensive data on world output of the crude materials from which they are produced and because of their significance among mineral commodities.

Further, it should be noted that pyrite (gross weight basis) has been omitted from the roster of commodities covered by individual world summary production tables. However, data on the sulfur content of

[5] Annales des Mines. No. 12, December 1975, p. 14.

pyrite has been provided as a separate entry in the revised format of the world sulfur production table, and such double coverage (both gross weight and sulfur content) is regarded as unnecessary.

The five new tables in this section have been compiled for a 5-year period, rather than the 3-year period of all other tables in this section, in order to provide data not summarized in this form in the past.

The data on world trade in major commodities presented in this chapter (tables 57 to 69) 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 67, covering world natural gas trade, is included for the first time, thereby providing coverage on trade in all commercial mineral fuel commodities. This table has been prepared in the form of a country-to-country trade table rather than on a continent-to-continent basis because of the special nature of the facilities required for moving gas (pipeline system or natural liquefaction and deliquefaction plants). Such facilities make this trade clearly intercountry rather than interregional.

Table 1.—United Nations indexes of world[1] mineral industry production

(1970=100)

Industry sector and geographic area	1973	1974	1975	1975, by quarter: 1st	2d	3d	4th
EXTRACTIVE INDUSTRIES							
Metals:							
Market economy countries	104	105	102	104	104	99	101
Developed[2]	100	99	96	96	100	93	94
United States and Canada	103	102	96	94	101	94	95
Europe	104	105	100	109	105	89	98
European Economic Community[3]	90	85	83	93	84	69	85
European Free Trade Association[4]	102	102	107	101	108	109	109
Australia and New Zealand	102	102	107	101	109	109	109
Developing[5]	110	115	112	117	111	109	111
Latin America[6]	109	119	115	129	112	110	100
Asia[7]	103	105	107	105	103	106	112
Centrally planned economy countries of Europe[8]	118	120	121	121	121	121	120
World	107	109	106	108	108	104	105
Coal:							
Market economy countries	88	85	88	92	89	79	90
Developed[2]	87	83	84	89	86	76	87
United States and Canada	102	102	112	112	116	105	114
Europe	83	76	76	82	77	67	78
European Economic Community[3]	81	74	73	80	74	63	75
European Free Trade Association[4]	96	97	90	92	94	81	92
Australia and New Zealand	116	133	128	128	137	107	140
Developing[5]	106	114	126	129	121	121	131
Latin America[6]	111	125	132	NA	NA	NA	NA
Asia[7]	104	112	125	131	121	121	126
Centrally planned economy countries of Europe[8]	107	110	113	112	114	112	114
World	96	96	98	100	100	94	100
Crude petroleum and natural gas:							
Market economy countries	121	121	114	112	110	117	116
Developed[2]	112	112	108	112	106	104	112
United States and Canada	104	102	98	100	97	98	99
Europe	159	166	169	196	153	127	199
European Economic Community[3]	166	175	177	208	160	130	212
European Free Trade Association[4 9]	--	--	--	--	--	--	--
Australia and New Zealand[9]	--	--	--	--	--	--	--
Developing[5]	127	127	117	113	112	126	118
Latin America[6]	102	99	100	96	98	106	100
Asia[7]	149	150	136	134	131	144	133
Centrally planned economy countries of Europe[8]	122	130	140	141	140	142	136
World	121	123	119	119	116	122	120
Total extractive industry:							
Market economy countries	112	112	107	107	106	107	108
Developed[2]	104	103	100	102	101	96	102
United States and Canada	105	104	100	100	100	98	100
Europe	100	98	97	103	98	85	100
European Economic Community[3]	98	96	94	102	95	81	99
European Free Trade Association[4]	110	112	107	111	112	102	102
Australia and New Zealand	136	144	146	142	148	141	151

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	1973	1974	1975	1975, by quarter 1st	2d	3d	4th
EXTRACTIVE INDUSTRIES—Continued							
Total extractive industry—Continued							
Market economy countries—Continued							
Developing[5]	123	126	118	115	113	123	118
Latin America[6]	105	109	108	111	105	109	106
Asia[7]	145	148	134	132	130	141	132
Centrally planned economy countries of Europe[8]	118	124	131	131	132	131	129
World	114	116	114	114	114	114	114
PROCESSING INDUSTRIES							
Base metals:							
Market economy countries	117	119	104	110	105	97	103
Developed[2]	117	118	100	107	102	93	98
United States and Canada	117	116	92	102	94	85	89
Europe	112	117	102	110	105	91	108
European Economic Community[3]	109	112	97	104	98	86	98
European Free Trade Association[4]	113	116	100	111	104	88	98
Australia and New Zealand	107	111	107	112	103	108	103
Developing[5]	121	137	146	137	148	148	151
Latin America[6]	128	145	153	142	159	152	158
Asia[7]	105	121	136	127	124	146	146
Centrally planned economy countries of Europe[8]	119	127	140	134	135	140	151
World	118	121	114	117	114	110	117
Nonmetallic mineral products:							
Market economy countries	122	121	113	107	115	114	116
Developed[2]	121	118	108	102	110	108	111
United States and Canada	123	119	105	97	104	110	108
Europe	118	118	112	108	117	108	114
European Economic Community[3]	116	115	109	105	113	105	113
European Free Trade Association[4]	117	118	100	103	108	92	98
Australia and New Zealand	122	116	114	99	117	120	120
Developing[5]	131	140	150	140	152	153	154
Latin America[6]	135	144	152	142	153	156	158
Asia[7]	125	137	148	135	152	154	151
Centrally planned economy countries of Europe[8]	125	134	143	142	145	144	142
World	124	126	125	121	127	126	126
Chemicals, petroleum and coal products:							
Market economy countries	127	130	124	119	122	123	130
Developed[2]	127	130	121	117	120	120	128
United States and Canada	126	128	120	112	117	123	127
Europe	126	131	124	125	125	116	131
European Economic Community[3]	125	129	121	122	121	113	128
European Free Trade Association[4]	123	129	111	120	120	106	123
Australia and New Zealand	127	126	113	107	114	115	117
Developing[5]	127	134	139	131	136	141	147
Latin America[6]	134	145	151	NA	NA	NA	NA
Asia[7]	117	115	117	113	110	122	125
Centrally planned economy countries of Europe[8]	134	149	167	167	169	167	164
World	128	135	134	130	133	133	136
OVERALL INDUSTRIAL PRODUCTION							
Market economy countries	120	121	115	114	115	113	120
Developed[2]	119	119	112	110	112	108	117
United States and Canada	119	119	109	106	108	110	112
Europe	116	118	115	116	116	104	123
European Economic Community[3]	114	116	112	114	113	102	120
European Free Trade Association[4]	115	119	112	113	114	100	121
Australia and New Zealand	119	117	116	110	116	120	120
Developing[5]	127	135	140	136	136	142	146
Latin America[6]	128	138	142	NA	NA	NA	NA
Asia[7]	131	137	144	147	134	146	147
Centrally planned economy countries of Europe[8]	128	140	153	151	154	153	153
World	122	126	126	124	126	124	130

NA Not available.

[1] Excludes Albania, the 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 classification "Asia, excluding Israel and Japan."

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

[9] Reported as none in source but Austria and Norway among European Free Trade Association countries, as well as both Australia and New Zealand, produce petroleum and natural gas; insufficient data were available to calculate index number.

Source: United Nations. Monthly Bulletin of Statistics. V. 30, No. 8, August 1976, pp. xii–xxv.

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

Commodity	1973	1974	1975 [p]
METALS			
Aluminum:			
Bauxite, gross weight ------thousand metric tons--	70,384	78,082	75,120
Alumina, gross weight ------do----	26,464	28,564	26,431
Unalloyed ingot metal ------do----	12,123	13,172	12,042
Antimony, mine output, metal content ------metric tons--	70,013	72,126	68,076
Arsenic, white [2,3] ------do----	46,272	50,660	46,399
Beryl concentrate, gross weight [2,3] ------do----	3,596	3,097	3,183
Bismuth [2] ------do----	3,688	4,047	3,579
Cadmium, smelter output ------do----	17,174	17,276	15,339
Chromite, gross weight [3] ------thousand metric tons--	6,696	7,427	7,941
Cobalt:			
Mine output, metal content ------metric tons--	29,451	32,497	32,937
Refined ------do----	23,159	25,329	20,863
Columbium-tantalum concentrates [3,4] ------do----	24,409	23,916	23,360
Copper:			
Mine output, metal content ------thousand metric tons--	7,117	7,315	6,967
Smelter ------do----	7,147	7,358	6,893
Refinery ------do----	7,270	7,279	6,883
Gold, mine output, metal content ------thousand troy ounces--	43,002	39,641	38,637
Iron and steel:			
Iron ore, gross weight ------thousand metric tons--	845,772	895,374	891,592
Pig iron ------do----	510,776	512,131	477,413
Ferroalloys ------do----	10,776	11,311	10,661
Crude steel ------do----	697,473	707,378	646,416
Lead:			
Mine output, metal content ------do----	3,485	3,476	3,438
Smelter ------do----	3,478	3,494	3,364
Magnesium, primary smelter [5] ------metric tons--	128,866	131,386	129,209
Manganese ore, gross weight ------thousand metric tons--	21,747	22,743	24,399
Mercury, mine output, metal content ------metric tons--	9,310	8,999	8,683
Molybdenum, mine output, metal content ------do----	83,946	86,356	81,274
Nickel:			
Mine output, metal content ------do----	709,732	790,748	818,440
Smelter ------do----	637,330	702,790	653,431
Platinum-group metals, mine output ------thousand troy ounces--	5,232	5,774	5,767
Selenium, smelter output [3,4] ------metric tons--	1,216	1,230	1,139
Silver, mine output, metal content ------thousand troy ounces--	307,974	294,935	293,452
Tellurium, smelter output [3,4] ------metric tons--	202	203	146
Tin:			
Mine output, metal content ------do----	237,847	233,747	225,195
Smelter ------do----	233,874	228,341	230,055
Titanium concentrates, gross weight:			
Ilmenite [3,4,6] ------thousand metric tons--	3,566	3,660	3,345
Rutile [2,3,4] ------do----	350	331	351
Tungsten, mine output, metal content ------metric tons--	37,952	36,971	37,488
Uranium oxide, mine output, U_3O_8 content [3,4] ------do----	23,404	22,296	23,987
Vanadium, mine output, metal content ------do----	19,638	19,091	21,555
Zinc:			
Mine output, metal content ------thousand metric tons--	5,710	5,699	5,563
Smelter ------do----	5,330	5,463	5,042
NONMETALS			
Asbestos ------do----	4,190	4,169	4,104
Barite ------do----	4,492	4,491	4,808
Cement, hydraulic ------do----	701,935	703,967	695,338
Clays:			
Bentonite [3,4] ------do----	4,107	4,408	4,293
Fuller's earth [3,4] ------do----	1,481	1,542	1,470
Kaolin [3] ------do----	15,394	16,237	14,805
Diamond:			
Gem [3] ------thousand carats--	12,462	12,212	10,867
Industrial [3] ------do----	30,605	32,310	30,259
Total [3] ------do----	43,067	44,522	41,126
Diatomite [3] ------thousand metric tons--	1,633	1,697	1,632
Feldspar [3] ------do----	2,763	3,055	2,741
Fluorspar ------do----	4,708	4,906	4,773
Graphite [2] ------metric tons--	392,491	489,177	437,974
Gypsum ------thousand metric tons--	61,498	58,584	54,414
Lime [3] ------do----	107,692	111,988	105,745
Magnesite [2] ------do----	9,122	10,036	9,954
Mica [3] ------do----	246	234	234
Nitrogen fertilizers, contained nitrogen ------do----	37,843	40,472	42,189
Phosphate rock ------do----	98,751	110,839	107,648
Potash, marketable, K_2O equivalent ------do----	21,775	23,756	22,364
Pumice [3,4] ------do----	15,713	13,975	13,551
Salt ------do----	154,702	164,792	162,008
Sodium compounds:			
Sodium carbonate [3] ------do----	21,371	22,091	21,118
Sodium sulfate [3] ------do----	4,024	4,080	3,926

See footnotes at end of table.

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

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Strontium minerals [3] [4] ____metric tons__	93,187	99,184	52,873
Sulfur, elemental basis:			
Elemental [7] ____thousand metric tons__	16,128	17,932	17,859
From pyrite ____do____	10,415	10,021	10,192
Byproduct [8] ____do____	21,650	22,184	21,872
Total ____do____	48,193	50,137	49,923
Talc, soapstone, pyrophyllite ____do____	5,406	5,706	4,856
Vermiculite [3] [4] ____metric tons__	498,234	503,342	523,355
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [3] [4] ____thousand metric tons__	3,558	3,540	3,110
Coal:			
Anthracite ____million metric tons__	177	176	177
Bituminous ____do____	2,088	2,126	2,240
Lignite ____do____	819	834	860
Total ____do____	3,084	3,136	3,277
Coke:			
Metallurgical [9] ____thousand metric tons__	365,826	367,317	361,198
Other [9] ____do____	17,705	18,152	17,495
Gas, natural, marketed ____billion cubic feet__	46,128	47,171	47,207
Natural gas liquids [3] ____million barrels__	1,043	1,034	1,024
Peat ____thousand metric tons__	220,145	220,695	223,327
Petroleum:			
Crude ____million 42-gallon barrels__	20,368	20,538	19,498
Refined ____do____	20,610	20,430	19,705

p Preliminary.

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

[2] Excludes data for the United States (withheld to avoid disclosing individual company confidential data).

[3] Excludes data for the People's Republic of China (no adequate basis for estimation available).

[4] Excludes data for the U.S.S.R. (no adequate basis for estimation available).

[5] Excludes data for the United States (withheld for 1974 and 1975 to avoid disclosing individual company confidential data, and excluded for 1973 in order to provide a uniform statistical series). U.S. output in 1973 totaled 111,068 metric tons, and was of the same general order of magnitude in 1974 and 1975.

[6] Includes titaniferous slag.

[7] Comprises sulfur produced by the Frasch process plus sulfur mined in the elemental state from ores.

[8] Comprises sulfur recovered from coal gasification, metallurgical operations (except pyrite processing), natural gas, petroleum, tar sands, spent oxides, and gypsum, whether recovered in the elemental state or as a sulfur compound.

[9] Production of coke, other than metallurgical coke, for the People's Republic of China and the U.S.S.R. included with metallurgical coke production.

Table 3.—Geographic distribution of world production of major mineral products in 1975

(Percent)

Commodity	Western Hemisphere: Northern North America	Western Hemisphere: Central America and Caribbean Islands	Western Hemisphere: South America	Western Hemisphere: Total	Eastern Hemisphere: Europe	Eastern Hemisphere: Africa	Eastern Hemisphere: Near East	Eastern Hemisphere: Far East	Eastern Hemisphere: Oceania	Eastern Hemisphere: Total
METALS										
Aluminum:										
Bauxite, gross weight	2.4	17.1	12.1	31.6	21.0	13.4	0.8	5.2	28.0	68.4
Alumina, gross weight	23.4	8.5	6.4	38.3	30.5	2.4	.6	8.8	19.4	61.7
Unalloyed ingot metal	36.8	.3	1.7	38.8	43.3	2.3	1.4	11.5	2.7	61.2
Antimony, mine output, metal content	3.1	6.1	17.7	26.9	17.5	25.7	5.0	22.8	2.1	73.1
Arsenic, white [1 2]	NA	13.2	3.1	16.3	68.9	14.4	--	.4	--	83.7
Beryl concentrate, gross weight [1 2]	NA	--	33.3	33.3	51.1	12.8	--	NA	2.8	66.7
Bismuth [1]	1.0	12.4	37.9	51.3	7.8	.1	--	29.0	11.8	48.7
Cadmium, smelter output	20.9	3.8	1.3	26.0	48.9	2.4	--	19.1	3.6	74.0
Chromite, gross weight [2]	--	.3	1.3	1.6	38.0	36.1	11.0	13.3	--	98.4
Cobalt:										
Mine output, metal content	4.1	4.9	--	9.0	9.3	68.0	--	.4	13.3	91.0
Refined	2.7	--	--	2.7	22.3	74.3	--	.7	--	97.3
Columbium-tantalum concentrates, gross weight [2 3]	15.9	--	77.5	93.4	NA	5.3	--	.8	.5	6.6
Copper:										
Mine output, metal content	28.8	1.2	14.7	44.7	20.3	21.1	.7	7.6	5.6	55.3
Smelter	24.0	1.1	12.8	37.9	25.2	19.7	.5	14.1	2.6	62.1
Gold, mine output, metal content	7.0	1.9	2.3	11.2	20.4	62.7	--	2.7	3.0	88.8
Iron and steel:										
Iron ore, gross weight	14.3	.5	13.0	27.8	40.1	7.2	.3	13.3	11.3	72.2
Pig iron and ferroalloys	17.1	.6	2.0	19.7	49.4	1.6	.4	27.4	1.5	80.3
Crude steel	18.4	.8	2.2	21.4	53.7	1.3	.1	22.3	1.2	78.6
Lead:										
Mine output, metal content	27.6	5.9	8.2	41.7	32.7	4.3	1.1	8.4	11.8	58.3
Smelter	22.2	5.3	4.5	32.0	43.9	2.6	.1	12.2	9.2	68.0
Magnesium, primary smelter [4]	3.5	--	--	3.5	89.1	--	--	7.4	--	96.5
Manganese ore, gross weight	--	1.8	6.9	8.7	37.0	36.2	.3	11.2	6.6	91.3
Mercury, mine output, metal content	8.5	5.7	1.4	15.6	65.0	5.4	3.5	10.5	(5)	84.4
Molybdenum, mine output, metal content	74.0	(5)	11.9	85.9	12.0	NA	--	2.1	(5)	14.1
Nickel:										
Mine output, metal content	32.0	8.3	.3	40.6	24.0	5.9	--	4.1	25.4	59.4
Smelter	24.8	7.5	.4	32.7	37.6	5.1	--	13.4	11.2	67.3
Platinum-group metals, mine output	7.7	--	.4	8.1	46.0	45.5	--	.4	(5)	91.9
Selenium, smelter output [2 3]	40.9	5.1	1.6	47.6	12.6	--	--	36.6	3.2	52.4
Silver, mine output, metal content	25.0	14.4	17.7	57.1	25.5	3.8	(5)	5.1	8.5	42.9
Tellurium, smelter output [2 3]	65.1	--	20.5	85.6	NA	NA	--	14.4	NA	14.4
Tin:										
Mine output, metal content	.1	.2	15.6	15.9	16.0	6.5	--	57.3	4.3	84.1
Smelter	2.8	.4	5.6	8.8	24.8	2.9	--	61.2	2.3	91.2

See footnotes at end of table.

Table 3.—Geographic distribution of world production of major mineral products in 1975—Continued

(Percent)

Commodity	Western Hemisphere: Northern North America	Western Hemisphere: Central America and Caribbean Islands	Western Hemisphere: South America	Western Hemisphere: Total	Eastern Hemisphere: Europe	Eastern Hemisphere: Africa	Eastern Hemisphere: Near East	Eastern Hemisphere: Far East	Eastern Hemisphere: Oceania	Eastern Hemisphere: Total
METALS—Continued										
Titanium concentrates, gross weight:										
Ilmenite [2,3,6]	41.9	--	0.2	42.1	19.5	--	--	8.1	30.3	57.9
Rutile [1,2,3]	NA	--	(5)	(5)	NA	--	--	1.9	98.1	100.0
Tungsten, mine output, metal content	9.7	.7	11.4	21.8	28.3	2.2	--	43.6	4.1	78.2
Uranium oxide, mine output, U_3O_8 content [2,3]	67.1	--	.1	67.2	9.6	23.2	--	NA	--	32.8
Vanadium, mine output, metal content	19.7	--	2.5	22.2	25.7	52.1	--	--	--	77.8
Zinc:										
Mine output, metal content	28.8	4.8	8.5	42.1	31.6	5.1	1.5	10.8	8.9	57.9
Smelter	17.4	3.0	2.6	23.0	50.2	3.6	--	19.5	3.7	77.0
NONMETALS										
Asbestos	27.6	--	1.6	29.2	50.8	13.5	1.2	4.4	.9	70.8
Barite	26.1	6.2	6.8	39.1	36.3	4.5	2.1	17.9	.1	60.9
Cement, hydraulic	10.5	2.5	4.8	17.8	52.9	3.1	3.6	21.7	.9	82.2
Clays:										
Bentonite [2,3]	68.2	.8	4.7	73.6	22.3	1.5	2.5	(5)	.1	26.4
Fuller's earth [2,3]	73.4	2.6	(5)	76.0	16.4	6.8	NA	.8	(5)	24.0
Kaolin [2]	32.7	.8	3.0	36.5	54.6	1.0	.9	6.1	.9	63.5
Diamond:										
Gem [2]	--	--	3.5	3.5	18.0	78.2	--	.3	--	96.5
Industrial [2]	--	--	3.2	3.2	25.6	71.2	--	(5)	--	96.8
Diatomite [2]	31.9	3.6	.6	36.1	62.7	.4	--	.2	.6	63.9
Feldspar [2]	22.7	5.3	5.2	33.2	61.0	1.5	--	4.2	.1	66.8
Fluorspar	4.0	22.8	2.2	29.0	43.8	7.1	(5)	20.1	(5)	71.0
Graphite [1]	NA	13.9	.6	14.5	35.3	4.2	--	46.0	--	85.5
Gypsum	26.7	3.1	2.8	32.6	52.3	2.6	5.9	4.8	1.8	67.4
Lime [2]	18.0	.3	5.5	23.8	63.2	1.7	1.2	9.3	.8	76.2
Magnesite [1]	NA	.4	3.8	4.2	59.6	1.0	4.8	30.2	.2	95.8
Mica [2]	52.3	.3	2.5	55.1	21.3	1.8	--	21.8	--	44.9
Nitrogen fertilizers, nitrogen content	22.3	1.3	1.0	24.6	52.5	1.1	1.6	19.7	.5	75.4
Phosphate rock	41.1	.4	.4	41.9	25.0	21.4	3.0	5.4	3.3	58.1
Potash, marketable, K_2O equivalent	31.8	--	--	31.8	62.5	1.3	2.6	1.8	--	68.2
Pumice [2,3]	26.2	2.8	1.3	30.3	69.0	.1	--	NA	.6	69.7
Salt	26.2	4.9	2.8	33.9	35.3	1.3	1.0	25.4	3.1	66.1
Sodium compounds:										
Sodium carbonate [2]	30.5	2.0	.7	33.2	57.5	.4	NA	8.9	NA	66.8
Sodium sulfate [2]	41.6	7.6	1.7	50.9	39.0	NA	2.6	7.5	NA	49.1
Strontium minerals [2,3]	47.3	27.8	.9	76.0	22.6	--	.6	.8	--	24.0

See footnotes at end of table.

Sulfur, elemental basis:[7]										
Elemental	41.0	12.1	.6	53.7	41.6	--	3.9	.8	--	46.3
From pyrite	2.5	.2	--	2.7	74.0	3.9	1.3	17.0	1.1	97.3
Byproduct	52.2	1.1	.8	54.1	30.1	.9	3.4	9.8	1.7	45.9
Talc, soapstone, pyrophyllite	18.7	(5)	7.0	25.7	28.1	.6	--	43.7	1.9	74.3
Vermiculite[2 3]	57.2	--	1.3	58.5	NA	41.1	--	.4	--	41.5
MINERAL FUELS AND RELATED MATERIALS										
Carbon black[2 3]	43.2	1.2	5.3	49.7	31.7	1.3	.2	14.8	2.3	50.3
Coal:										
Anthracite and bituminous	24.4	.2	.4	25.0	41.6	3.0	.3	27.2	2.9	75.0
Lignite	2.5	--	--	2.5	92.6	--	.9	.7	3.3	97.5
Coke:										
Metallurgical[8]	15.7	.6	.8	17.1	56.0	1.4	.5	23.6	1.4	82.9
Other[9]	--	(5)	.3	.3	52.9	.8	.2	45.6	.2	99.7
Gas, natural, marketed	49.1	1.3	2.3	52.7	37.9	1.3	3.0	4.7	.4	47.3
Natural gas liquids[2]	69.2	3.1	4.5	76.8	10.6	2.3	8.1	.4	1.8	23.2
Peat	.6	--	--	.6	99.4	--	--	(5)	--	99.4
Petroleum:										
Crude	18.4	1.9	6.3	26.6	20.4	9.4	36.6	6.2	.8	73.4
Refined	29.0	3.6	5.0	37.6	40.7	1.7	4.5	14.3	1.2	62.4

NA Production data not available and no basis available for reliable estimate of output level.

[1] Percentages based on a world total that excludes data for the United States (withheld to avoid disclosing individual company confidential data), inclusion of which would significantly alter percentages for all countries.

[2] Percentages based on a world total that excludes data for the People's Republic of China (no adequate basis for estimation available) inclusion of which might significantly alter percentages for all countries.

[3] Percentages based on a world total that excludes data for the U.S.S.R. (no adequate basis for estimation available), inclusion of which might significantly alter percentages for all countries.

[4] Percentages based on a world total that excludes data for the United States (withheld to avoid disclosing individual company confidential data). On the basis of results for 1973, when the U.S. figure was publishable, all other nations together accounted for only slightly more than one-half of the world total (the United States accounted for 46.8% alone), and thus the percentages presented here would be virtually halved if the U.S. figure were included in the total.

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

[6] Percentages based on a world total of ilmenite plus titaniferous slag.

[7] For details on forms of sulfur included in each of the three subgroups, see footnotes to table 2.

[8] Percentages based on a world total that includes coke other than metallurgical for the People's Republic of China and the U.S.S.R.

[9] Percentages based on a world total that excludes figures for the People's Republic of China and the U.S.S.R. (These data are reported as an inseparable part of the data entered under metallurgical coke.)

Table 4.—Role of various country groups in production of major mineral products in 1975

Commodity	Developed market economies	Developing market economies	Total market economies	Centrally planned economies	EEC	EFTA	OECD	OPEC	CMEA
METALS									
Aluminum:									
Bauxite, gross weight	41.2	47.3	88.5	11.5	3.4	--	42.0	1.3	10.2
Alumina, gross weight	64.0	19.3	83.3	16.7	12.5	--	64.6	--	15.2
Unalloyed ingot metal	75.4	6.8	82.2	17.8	15.2	6.9	74.7	.9	16.5
Antimony, mine output, metal content	33.9	36.3	70.2	29.8	1.4	.8	15.5	.1	12.2
Arsenic, white [1 2]	53.5	30.7	84.2	15.8	18.1	35.0	53.5	--	15.8
Beryl concentrate, gross weight [1 2]	3.7	46.0	49.7	50.3	--	.8	3.6	--	50.3
Bismuth [1]	35.5	53.6	89.1	10.9	2.0	.4	35.5	--	3.9
Cadmium, smelter output	69.7	7.3	77.0	23.0	22.8	.6	69.1	--	21.6
Chromite, gross weight [2]	28.8	35.3	64.1	35.9	--	--	11.1	2.2	26.5
Cobalt:									
Mine output, metal content	15.4	74.2	89.6	10.4	--	--	15.4	--	10.4
Refined	16.6	74.8	91.4	8.6	6.0	3.7	16.6	--	8.6
Columbium-tantalum concentrates, gross weight [2 3]	16.4	83.6	100.0	NA	--	--	16.4	4.2	NA
Copper:									
Mine output, metal content	39.6	42.2	81.8	18.2	.1	1.1	37.4	.9	16.5
Smelter	49.5	32.5	82.0	18.0	2.6	1.1	47.7	.1	16.3
Gold, mine output, metal content	68.9	11.0	79.9	20.1	.1	.2	9.5	.3	19.6
Iron and steel:									
Iron ore, gross weight	40.2	24.4	64.6	35.4	6.9	4.6	39.0	3.3	27.0
Pig iron and ferroalloys	60.6	5.3	65.9	34.1	18.3	1.8	59.5	.4	26.9
Crude steel	60.3	5.0	65.3	34.7	19.5	1.8	59.3	.4	29.8
Lead:									
Mine output, metal content	52.0	21.3	73.3	26.7	4.3	2.4	52.9	1.0	20.9
Smelter	58.4	13.1	71.5	28.5	12.6	1.5	58.5	--	22.7
Magnesium, primary smelter [4]	50.5	--	50.5	49.5	10.8	29.6	50.5	--	48.7
Manganese ore, gross weight	30.7	28.3	59.0	41.0	--	--	7.2	9.4	36.9
Mercury, mine output, metal content	49.2	16.1	65.3	34.7	15.2	--	52.7	5.3	24.3
Molybdenum, mine output, metal content	74.8	12.0	86.8	13.2	--	.6	74.8	--	11.4
Nickel:									
Mine output, metal content	47.7	27.9	75.6	24.4	--	([5])	45.2	2.6	23.7
Smelter	58.8	17.2	76.0	24.0	7.3	5.7	56.2	--	24.0
Platinum-group metals, mine output	53.6	.4	54.0	46.0	--	--	8.1	--	46.0
Selenium, smelter output [2 3]	93.3	6.7	100.0	NA	4.4	4.0	93.3	--	NA
Silver, mine output, metal content	43.6	37.2	80.8	19.2	1.9	1.5	42.7	.4	18.7
Tellurium, smelter output [2 3]	79.5	20.5	100.0	NA	NA	--	79.5	--	NA
Tin:									
Mine output, metal content	8.0	68.2	76.2	23.8	1.7	.2	6.8	12.9	13.9
Smelter	17.2	59.6	76.8	23.2	7.6	.2	16.9	9.7	13.5

Titanium concentrates, gross weight:									
Ilmenite [2,3,6]	91.8	8.2	100.0	NA	--	15.8	91.8	--	NA
Rutile [1,2,3]	98.1	1.9	100.0	NA	--	--	98.1	--	NA
Tungsten, mine output, metal content	23.1	26.2	49.3	50.7	2.3	4.1	23.1	--	21.0
Uranium oxide, mine output, U_3O_8 content [2,3]	88.4	11.6	100.0	NA	8.4	.7	76.7	4.6	NA
Vanadium, mine output, metal content	79.9	5.2	85.1	14.9	--	4.8	30.5	--	14.9
Zinc:									
Mine output, metal content	54.4	21.7	76.1	23.9	6.6	2.9	55.0	1.4	19.2
Smelter	64.5	8.8	73.3	26.7	20.0	1.5	63.2	.2	22.0
NONMETALS									
Asbestos	41.2	8.3	49.5	50.5	3.6	--	33.0	--	46.8
Barite	51.8	29.0	80.8	19.2	19.1	--	52.0	3.3	11.5
Cement, hydraulic	49.1	19.5	68.6	31.4	18.1	2.7	49.4	2.2	26.0
Clays:									
Bentonite [2,3]	86.9	8.4	95.3	4.7	6.8	--	86.8	1.7	4.7
Fuller's earth [2,3]	89.8	10.2	100.0	NA	16.4	--	89.8	4.1	NA
Kaolin [2]	68.8	9.9	78.7	21.3	30.6	.8	68.4	1.0	21.3
Diamond:									
Gem [2]	31.6	50.4	82.0	18.0	--	--	--	2.3	18.0
Industrial [2]	12.8	61.6	74.4	25.6	--	--	--	2.7	25.6
Diatomite [2]	70.1	4.8	74.9	25.1	34.8	.2	70.1	.3	25.1
Feldspar [2]	75.0	15.7	88.7	11.3	31.1	11.2	73.9	.2	11.3
Fluorspar	38.0	33.7	71.7	28.3	21.8	.1	33.7	--	20.4
Graphite [1]	13.5	36.1	49.6	50.4	4.1	9.3	13.4	--	21.9
Gypsum	69.7	15.8	85.5	14.5	28.4	1.8	69.1	5.2	13.0
Lime [2]	52.6	7.8	60.4	39.6	18.7	2.2	51.1	1.0	39.6
Magnesite [1]	35.4	12.5	47.9	52.1	--	12.7	39.4	.2	25.0
Mica [2]	56.8	25.3	82.1	17.9	1.7	1.7	55.7	--	17.9
Nitrogen fertilizers, nitrogen content	52.6	11.2	63.8	36.2	17.4	2.2	52.2	1.8	28.8
Phosphate rock	46.3	26.4	72.7	27.3	.1	--	43.8	.8	22.4
Potash, marketable, K_2O equivalent	56.9	1.3	58.2	41.8	20.1	--	54.3	--	40.0
Pumice [2,3]	95.8	4.2	100.0	NA	57.6	.1	95.8	--	NA
Salt	51.3	15.6	66.9	33.1	18.4	1.0	51.5	.6	14.2
Sodium compounds:									
Sodium carbonate [2]	57.7	6.7	64.4	35.6	18.2	.7	57.7	NA	35.5
Sodium sulfate [2]	69.8	11.9	81.7	18.3	12.9	1.3	71.8	.6	18.3
Strontium minerals [2,3]	69.9	30.1	100.9	NA	6.5	--	69.9	.6	NA
Sulfur, elemental basis: [7]									
Elemental	42.0	16.6	58.6	41.4	.3	--	42.1	3.8	40.7
From pyrite	43.1	3.5	46.6	53.4	7.3	6.2	40.8	.1	42.6
Byproduct	81.5	6.4	87.9	12.1	14.7	1.0	81.1	3.7	11.5
Talc, soapstone, pyrophyllite	63.4	20.6	84.0	16.0	9.2	4.9	63.0	--	10.2
Vermiculite [2,3]	96.9	3.1	100.0	NA	--	--	57.2	--	NA

See footnotes at end of table.

Table 4.—Role of various country groups in production of major mineral products in 1975—Continued

Commodity	Developed market economies	Developing market economies	Total market economies	Centrally planned economies	EEC	EFTA	OECD	OPEC	CMEA
MINERAL FUELS AND RELATED MATERIALS									
Carbon black [2] [3]	86.7	9.6	96.3	3.7	25.3	0.8	85.4	0.9	3.7
Coal:									
Anthracite and bituminous	41.7	5.9	47.6	52.4	10.3	--	39.0	.1	30.9
Lignite	27.6	1.3	28.9	71.1	14.8	.4	28.5	--	71.3
Coke:									
Metallurgical [8]	54.9	4.9	59.8	40.2	21.8	.6	54.1	.1	31.8
Other [9]	35.6	22.2	57.8	42.2	10.5	.2	35.2	--	42.2
Gas, natural, marketed	62.5	9.4	71.9	28.1	12.5	.2	62.5	5.2	25.1
Natural gas liquids [2]	72.2	18.4	90.6	9.4	1.1	--	72.2	18.2	9.4
Peat	5.4	--	5.4	94.6	4.5	.1	5.4	--	94.6
Petroleum:									
Crude	20.4	57.4	77.8	22.2	.4	.5	20.4	51.0	19.2
Refined	62.1	18.0	80.1	19.9	18.7	1.4	61.7	5.7	17.8

NA Production data not available and no basis available for reliable estimate of output level.

[1] Percentages based on a world total that excludes data for the United States (withheld to avoid disclosing individual company confidential data), inclusion of which would significantly alter percentages for all countries.

[2] Percentages based on a world total that excludes data for the People's Republic of China (no adequate basis for estimation available), inclusion of which might significantly alter percentages for all countries.

[3] Percentages based on a world total that excludes data for the U.S.S.R. (no adequate basis for estimation available), inclusion of which might significantly alter percentages for all countries.

[4] Percentages based on a world total that excludes data for the United States (withheld to avoid disclosing individual company confidential data). On the basis of results for 1973, when the U.S. figure was publishable, all other nations together accounted for only slightly more than one-half of the world total (the United States accounted for 46.8% alone), and thus the percentages presented here would be virtually halved if the U.S. figure were included in the total.

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

[6] Percentages based on a world total of ilmenite plus titaniferous slag.

[7] For details on forms of sulfur included in each of the three subgroups, see footnotes to table 2.

[8] Percentages based on a world total that includes coke other than metallurgical for the People's Republic of China and the U.S.S.R.

[9] Percentages based on a world total that excludes figures for the People's Republic of China and the U.S.S.R. (These data are reported as an inseparable part of the data entered under metallurgical coke.)

NOTE.—EEC: European Economic Community.
EFTA: European Free Trade Association.
OECD: Organization for Economic Cooperation and Development.
OPEC: Organization of Petroleum Exporting Countries.
CMEA: Council for Mutual Economic Assistance.

Table 5.—Value of world export trade in major mineral commodity groups[1]

(Million dollars)

Commodity group[1]	1970	1971	1972	1973 r	1974
Metals:					
All ores, concentrates, scrap	8,110	7,120	7,730	11,170	15,630
Iron and steel	17,070	17,760	20,080	28,480	46,440
Nonferrous metals	12,200	10,410	11,700	17,220	25,180
Subtotal	37,380	35,290	39,510	56,870	87,250
Nonmetals (crude only)	2,380	2,820	3,190	4,030	5,770
Mineral fuels	r 28,440	r 36,180	r 44,020	65,060	170,120
Total	r 68,200	r 74,290	r 86,720	125,960	263,140
All commodities	r 312,260	r 348,850	r 415,280	575,640	835,490

r Revised.
[1] Data presented are for selected major commodity groups of the Standard International Trade Classification—Revised (SITC—R), and as such exclude 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; and 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. 30, No. 8, August 1976, pp. xxvii–xlv.

Table 6.—Distribution of total value of export trade in major mineral commodity groups[1]

(Percent)

Commodity group[1]	1970	1971	1972	1973	1974
Metals:					
All ores, concentrates, scrap	11.9	r 9.6	8.9	r 8.9	5.9
Iron and steel	r 25.0	r 23.9	23.1	r 22.6	17.7
Nonferrous metals	17.9	14.0	13.5	13.7	9.6
Total	r 54.8	r 47.5	45.5	r 45.2	33.2
Nonmetals (crude only)	3.5	3.8	3.7	r 3.2	2.2
Mineral fuels	r 41.7	r 48.7	50.8	r 51.6	64.6
Grand total	100.0	100.0	100.0	100.0	100.0

r Revised.
[1] For detailed definition of groups, see footnote 1, table 5.

Table 7.—Growth of value of export trade in major mineral commodity groups[1]

(Percent increase over previous year)

Commodity group[1]	1970	1971	1972	1973	1974
Metals:					
All ores, concentrates, scrap	27.5	−12.2	8.6	44.5	39.9
Iron and steel	24.5	4.0	13.1	41.8	63.1
Nonferrous metals	9.1	−14.7	12.4	47.2	46.2
All metals	19.6	−5.6	12.0	43.9	53.4
Nonmetals (crude only)	4.9	18.5	13.1	26.3	43.2
Mineral fuels	16.2	27.2	21.7	47.8	161.5
All major mineral commodity groups	17.6	9.1	16.7	45.3	108.9
All commodity groups	14.8	11.7	19.0	38.6	45.1

[1] For detailed definition of groups, see footnote 1, table 5.

Table 8.—Significance of trade in major mineral commodity groups [1] to total trade of various world areas in 1974

Area and country [2]	Value, millions: Major mineral commodity groups: Exports from	Value, millions: Major mineral commodity groups: Exports to	Value, millions: All commodities: Exports from	Value, millions: All commodities: Exports to	Major minerals' share of total commodities (percent): Exports from	Major minerals' share of total commodities (percent): Exports to
Northern North America:						
Canada	$11,010	$5,885	$32,780	$30,070	33.6	19.6
United States	9,630	38,380	97,140	100,000	9.9	38.4
Total	20,640	44,265	129,920	130,070	15.9	34.0
Latin America	[3] 25,060	19,545	48,680	55,700	[4] 51.5	35.1
Europe:						
Market economy countries:						
EEC	48,400	95,560	274,440	288,130	17.6	33.2
EFTA	6,645	14,030	49,340	58,740	13.5	23.9
Other	2,475	8,820	13,260	27,720	18.7	31.8
Subtotal	57,520	118,410	337,040	374,590	17.1	31.6
Centrally planned economy countries	16,950	12,680	64,640	62,350	26.2	20.3
Total	74,470	131,090	401,680	436,940	18.5	30.0
Africa:						
Republic of South Africa	[5] 335	1,777	4,980	8,140	[4] 6.7	21.8
Other	[6] 27,870	5,056	38,390	31,580	[4] 72.6	16.0
Total	28,205	6,833	43,370	39,720	65.0	17.2
Near East	[7] 83,100	6,352	87,570	28,540	[4] 94.9	22.3
Far East and South Asia:						
Market economy countries:						
Japan	[8] 12,180	32,385	55,530	56,980	[4] 21.9	56.8
Other	[3] 11,680	14,195	46,070	59,040	[4] 25.4	24.0
Subtotal	23,860	46,580	101,600	116,020	23.5	40.2
Centrally planned economy countries	1,060	1,918	6,490	8,300	16.3	23.1
Total	24,920	48,498	108,090	124,320	23.1	39.0
Australia and New Zealand	[3] 3,625	2,574	13,220	14,070	[4] 27.4	18.3
Not reported	3,120	3,983	2,960	6,130	([9])	65.0
Grand total	263,140	263,140	835,490	835,490	31.5	31.5

[1] For detailed definition of groups, see footnote 1, table 5.

[2] Regional groups 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; and (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."

[9] Value of major mineral commodities from "Not reported" exceeds value of all commodities exported from that area by $160 million. Discrepancy may be due in part to (1) revisions in totals reported in later source data for developed market economy countries which could not be distributed among those countries individually, and (2) rounding.

Source: United Nations. Monthly Bulletin of Statistics. V. 30, No. 2, February 1976, pp. xxviii–xlii, and No. 8, August 1976, pp. xxviii–xlv.

Table 9.—Export origins and destinations for major mineral commodity group[1] shipments, by value, in 1974

(Million 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	2,430	800	2,080	520	5,180	285	1,440	455	145	3,560
United States	1,470	2,560	1,500	660	3,440	1,930	5,690	3,930	380	26,450
Total[3]	3,900	3,360	3,580	1,180	8,620	2,215	7,130	4,385	525	30,010
Latin America	2,850	480	2,900	(4)	18,830	305	3,990	1,040	260	13,950
Europe:										
Market economy countries:										
EEC	2,330	22,460	7,570	1,090	14,950	5,850	13,130	11,700	2,390	62,490
EFTA	780	2,870	1,930	165	900	720	3,430	1,730	420	7,730
Other[3]	140	840	670	135	690	600	1,600	670	280	5,670
Subtotal	3,250	26,170	10,170	1,390	16,540	7,170	18,160	14,100	3,090	75,890
Centrally planned economy countries	1,150	3,680	1,920	800	9,400	1,080	5,710	1,280	730	3,880
Total	4,400	29,850	12,090	2,190	25,940	8,250	23,870	15,380	3,820	79,770
Africa:										
Republic of South Africa	(4)	(4)	(4)	190	145	34	455	67	21	1,200
Other	870	(4)	2,590	1,370	23,040	76	2,000	305	105	2,570
Total[3]	870	(4)	2,590	1,560	23,185	110	2,455	372	126	3,770
Near East	(4)	(4)	(4)	(4)	83,100	27	2,870	335	110	3,010
Far East and South Asia:										
Market economy countries:										
Japan	(4)	10,790	1,140	(4)	250	3,690	310	2,020	455	25,910
Other	940	800	1,260	(4)	8,680	425	3,530	880	260	9,100
Subtotal[3]	940	11,590	2,400	(4)	8,930	4,115	3,840	2,900	715	35,010
Centrally planned economy countries	90	155	165	140	510	70	1,240	445	28	135
Total[3]	1,030	11,745	2,565	140	9,440	4,185	5,080	3,345	743	35,145
Australia and New Zealand	1,490	415	750	(4)	970	84	660	155	135	1,540
Not reported[3]	1,090	590	705	700	35	454	385	168	51	2,925
Grand total	15,630	46,440	25,180	5,770	170,120	15,630	46,440	25,180	5,770	170,120

[1] For detailed definition of groups, see footnote 1, table 5.
[2] For detailed definition of areas listed, see footnote 2, table 8.
[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. 30, No. 2, February 1976, pp. xxviii–xlii, and No. 8, August 1976, pp. xxvii–xlv.

Table 10.—Direction of trade in m
(Million

Source [2]	Northern North America			Latin America	Market economy Europe			
	United States	Canada	Total [3]		EEC	EFTA	Other [3]	Total
Northern North America:								
America:								
Canada	7,550	XX	7,550	203	1,435	317	52	1,804
United States	XX	1,885	1,885	1,695	2,090	192	293	2,575
Total [3]	7,550	1,885	9,435	1,898	3,525	509	345	4,379
Latin America [6]	12,480	1,478	13,958	5,620	1,677	276	232	2,185
Europe:								
Market economy countries:								
EEC	3,333	341	3,674	1,472	26,470	5,865	1,615	33,950
EFTA	381	44	425	157	3,570	1,432	188	5,190
Other [3]	300	17	317	57	990	158	112	1,260
Subtotal	4,014	402	4,416	1,686	31,030	7,455	1,915	40,400
Centrally planned economy countries	318	49	367	458	4,225	2,412	1,213	7,850
Total [3]	4,332	451	4,783	2,144	35,255	9,867	3,128	48,250
Africa:								
Republic of South Africa [7]	NA	NA	NA	NA	NA	NA	NA	NA
Other [8]	4,168	192	4,360	2,203	16,700	783	1,147	18,630
Total [3]	4,168	192	4,360	2,203	16,700	783	1,147	18,630
Near East [9]	4,790	1,480	6,270	5,550	34,110	2,140	3,430	39,680
Far East and South Asia:								
Market economy countries:								
Japan [10]	2,443	341	2,784	1,525	810	210	242	1,262
Other [6]	2,115	4	2,119	524	586	42	58	686
Subtotal	4,558	345	4,903	2,049	1,396	252	300	1,948
Centrally planned economy countries	12	1	13	8	104	17	10	131
Total [3]	4,570	346	4,916	2,057	1,500	269	310	2,079
Australia and New Zealand [6]	117	3	120	8	631	13	31	675
Not reported [3]	373	50	423	65	2,162	173	197	2,532
Grand total [4]	38,380	5,885	44,265	19,545	95,560	14,030	8,820	118,410

NA Not available. XX Not applicable.

[1] For detailed listing of commodities included, see footnote 1, table 5. It should be noted that certain commodities excluded for specific areas as indicated by footnotes are presumably included in grand totals.

[2] For detailed definition of areas listed, see footnote 2, table 8.

[3] Not reported in source but derived from data therein.

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

[5] Detail exceeds total by $1 million in the case of Canada and $1,450 million in the case of "Not reported." Discrepancy is presumed to be due, in part to (1) revisions in totals reported in later source data for developed market economy countries which could not be distributed among those countries individually, and (2) rounding.

[6] Excludes crude nonmetals.

[7] Includes crude nonmetals and mineral fuels only.

[8] Excludes iron and steel.

[9] Includes mineral fuels only.

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

Source: United Nations. Monthly Bulletin of Statistics, V. 30, No. 2, February 1976, pp. xxviii–xlii, and No. 8, August 1976, pp. xxviii–xlv.

ajor mineral commodities [1] in 1974
dollars)

Destination [2]											
		Africa			Market economy Far East and South Asia						
Centrally planned economy Europe	Near East	Republic of South Africa	Other	Total [3]	Japan	Other	Total [3]	Centrally planned economy Far East and South Asia	Australia and New Zealand	Not reported [3]	Grand total [4]
11	38	16	28	44	1,095	118	1,213	85	63	(5)	11,010
44	257	83	161	244	2,159	611	2,770	15	115	30	9,630
55	295	99	189	288	3,254	729	3,983	100	178	29	20,640
266	7	14	143	157	921	34	955	170	20	1,722	25,060
2,859	1,376	319	1,819	2,138	201	516	717	305	144	1,765	48,400
474	79	35	60	95	67	48	115	27	28	55	6,645
422	149	6	136	142	43	6	49	62	2	15	2,475
3,755	1,604	360	2,015	2,375	311	570	881	394	174	1,835	57,520
6,480	222	--	361	361	570	305	875	216	5	116	16,950
10,235	1,826	360	2,376	2,736	881	875	1,756	610	179	1,951	74,470
NA	NA	XX	NA	NA	NA	NA	NA	NA	NA	335	335
350	47	6	569	575	1,353	157	1,510	56	4	135	27,870
350	47	6	569	575	1,353	157	1,510	56	4	470	28,205
800	2,650	1,120	1,120	2,240	17,170	7,040	24,210	NA	1,220	480	83,100
653	1,222	162	390	552	XX	2,850	2,850	878	406	48	12,180
126	70	5	85	90	5,717	1,882	7,599	27	198	241	11,680
779	1,292	167	475	642	5,717	4,732	10,449	905	604	289	23,860
98	18	2	26	28	575	101	676	NA	4	84	1,060
877	1,310	169	501	670	6,292	4,833	11,125	905	608	373	24,920
1	17	6	6	12	1,763	331	2,094	73	217	408	3,625
96	200	3	152	155	751	196	947	4	148	(5)	3,120
12,680	6,352	1,777	5,056	6,833	32,385	14,195	46,580	1,918	2,574	3,983	263,140

Table 11.—Iron ore consumption,[1] by selected major country

(Million metric tons)

Country	1973	1974	1975 p
EEC:			
Belgium	r 21.7	22.3	15.7
France [2]	r 40.3	51.7	34.8
Germany, West	r 59.8	65.8	49.1
Italy	r 16.0	18.4	e 15.2
Luxembourg	r 12.7	12.6	9.3
Netherlands	r 7.6	7.8	6.5
United Kingdom [3]	r 27.5	22.1	19.8
Total	r 185.6	200.7	150.4
EFTA:			
Austria	r 5.8	6.4	5.6
Norway	r 2.0	2.2	2.3
Portugal e	.5	.4	.4
Sweden	10.3	5.1	e 9.9
Total	r 18.6	14.1	18.2
Other European market economies:			
Finland	r 2.2	2.2	2.2
Spain	r 10.7	11.9	e 12.4
Total	r 12.9	14.1	14.6
Centrally planned economy countries of Europe:			
Czechoslovakia e	r 15.3	r 16.9	18.0
Hungary	r 4.3	4.7	4.6
Poland [4]	r 13.5	15.0	NA
Romania e	9.5	10.0	NA
U.S.S.R. e	171.0	177.2	182.8
Yugoslavia	r 3.2	3.5	3.4
Total	r 216.8	227.3	208.8
Other:			
Canada e	14.6	14.6	15.7
Japan	r 117.4	121.5	118.9
Turkey	2.9	e 2.2	e 2.1
United States	r 149.3	140.4	115.9
Total	r 284.2	278.7	252.6
Grand total	r 718.1	734.9	644.6

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 211,000 tons of contained metal for steelworks in 1973, and 208,000 tons in 1974.

Source: United Nations Economic Commission for Europe. 1975 Annual Bulletin of Steel Statistics for Europe. V. 3, 1976. Official production and trade statistics for selected countries were also used as source material.

Table 12.—Iron and steel scrap consumption, by selected country [1]

(Thousand metric tons)

Country	1971	1972	1973	1974	1975
EEC:					
Belgium [2]	3,467	4,360	4,590	4,925	3,711
Denmark [2]	520	506	420	523	575
France [3 4 5]	8,128	8,560	8,993	9,380	7,536
Germany, West [4]	21,176	22,713	24,984	25,578	20,407
Ireland	e 75	e 85	110	110	e 80
Italy [3]	11,174	12,378	13,238	14,710	13,650
Luxembourg	1,545	1,634	1,773	1,903	1,373
Netherlands	2,227	2,242	2,040	2,125	1,582
United Kingdom [2 5]	17,879	18,691	e 18,600	16,955	15,899
Total [6]	66,191	71,169	74,748	76,209	64,813
EFTA:					
Austria [3 5]	1,578	1,575	1,585	1,727	1,474
Norway [2 4 5]	[3] 484	[3] 490	[3] 508	559	561
Portugal [2 3 4 5]	167	e 170	e 180	e 140	e 170
Sweden [2 3]	3,164	3,285	r 3,587	3,737	e 3,350
Total [6]	5,393	5,520	5,860	6,163	5,555

See footnotes at end of table.

Table 12.—Iron and steel scrap consumption, by selected country [1]—Continued

(Thousand metric tons)

Country	1971	1972	1973	1974	1975
Other European market economy countries: [8]					
Finland	586	717	742	709	696
Spain	[e, 5] 5,300	[5] 5,848	[5] 6,518	7,465	[e] 6,700
Yugoslavia [8]	1,616	1,535	1,729	[e] 1,900	[e] 2,000
Total [6]	7,502	8,100	8,989	10,074	9,396
European centrally planned economy countries: [8]					
Czechoslovakia [2,4,5]	[3] 4,534	[3] 5,981	5,593	6,918	7,154
Germany, East [2,3,4,5]	[e] 4,300	[e] 4,360	[e] 4,370	4,387	4,402
Hungary [2,4,5]	1,937	2,052	2,044	2,076	2,170
Poland [2,4,5]	[e] 6,900	7,318	7,863	8,237	[e] 8,500
Romania [2,4,5,9]	2,995	2,830	[e] 2,800	[e] 3,000	[e] 3,200
U.S.S.R. [2,3,4,5,10]	[11] 43,850	44,947	46,257	46,862	46,998
Total [6]	64,516	67,488	68,927	71,480	72,424
Latin America: [12]					
Argentina [5]	[e] 1,480	[e] 1,660	1,704	1,772	1,595
Brazil [5]	[e] 2,780	[e] 3,020	3,314	3,421	3,665
Chile [5]	[e] 215	[e] 160	181	227	168
Colombia [5]	[e] 155	[e] 180	173	168	225
Mexico [5]	[e] 2,240	[e] 2,590	2,784	2,705	3,323
Peru [5]	[e] 68	[e] 70	136	158	174
Venezuela [5]	[e] 500	[e] 610	573	568	527
Other [5,13]	[e] 12	[e] 12	11	22	40
Total [6]	[e] 7,450	[e] 8,302	8,876	9,041	9,717
Other countries:					
Canada [2,3,4,5]	5,240	5,487	6,923	7,114	6,753
India [2,3,4,5]	[14] 1,596	[14] 1,473	[14] 1,582	[e] 1,620	[e] 1,800
Japan [5]	33,406	39,668	48,651	46,146	34,214
South Africa, Republic of [2,3,4,5]	[15] 2,175	[15] 2,007	[15] 2,352	[e] 2,440	[e] 2,700
Turkey [2,5]	[e] 320	[e] 455	[e] 260	637	[e] 460
United States [2]	74,904	86,418	93,975	95,708	74,689
Total [6]	117,641	135,508	153,743	153,665	120,616
Grand total [6]	268,693	296,087	321,143	326,632	282,521

[e] Estimate.

[1] Unless otherwise noted, figures represent consumption of scrap in the production of pig iron, ferroalloys, crude steel, foundry products, and rerolled steel, as well as in other unspecified uses by the steel industry and by other (unspecified) industries. Also, unless otherwise noted, figures are from: United Nations Economic Commission for Europe. 1975 Annual Bulletin of Steel Statistics for Europe. V. 3, 1976, 97 pp.

[2] Excludes scrap consumed in rerolling.

[3] Excludes scrap consumed in foundries.

[4] Excludes scrap consumed within the steel industry for purposes other than manufacture of pig iron, ferroalloys, crude steel, and foundry products, and that used in rerolling.

[5] Excludes scrap used outside the steel industry.

[6] Total of listed figures.

[7] Central Statistics Bureau. Bergshantering (Mining) 1973. Stockholm, 1974, p. 105.

[8] Following United Nations practice, Yugoslavia has been included with other market economy nations of Western Europe.

[9] Excludes scrap used in production of pig iron.

[10] Excludes scrap used in production of steel by any method of production except open-hearth furnace.

[11] British Steel Corporation. International Steel Statistics, U.S.S.R. 1973, p. 2.

[12] 1971–72: U.S. Bureau of Mines estimates; 1973–74: Latin American Iron and Steel Institute. Anuario Estadistico de la Siderurgia y Mineria del Fierro de America Latina 1974, p. 18, Santiago (undated); 1975: Latin American Iron and Steel Institute. Informativo Estadistico No. 29, September 16, 1976 (not paginated). Data for 1973–74 are given in sources as total consumption by the steel industry, but no breakdown by use within that industry is provided, and sources do not make it clear whether or not consumption in foundries and rerolling plants is included; consumption other than in the steel industry is clearly excluded.

[13] Uruguay plus unspecified countries in Central America, as reported in source.

[14] British Steel Corporation. International Steel Statistics, India 1973, p. 2.

[15] British Steel Corporation. International Steel Statistics, Republic of South Africa 1973, p. 2.

Table 13.—Estimated world[1] consumption of major nonferrous metals

(Thousand metric tons)

Commodity	1973 r	1974	1975 p
Aluminum[2]	13,248	13,957	11,777
Copper[3]	8,785	8,401	7,430
Lead[4]	4,266	4,098	3,582
Zinc[5]	5,934	5,776	4,996
Tin[6]	213	199	171

p Preliminary. r Revised.

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

[2] 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 tons annually.

Source: American Bureau of Metal Statistics, Inc. Nonferrous Metal Data, 1975. New York, 1976, 143 pp.

Table 14.—World energy consumption,[1] by energy source

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

Area[2] and year	Solid fuels	Liquid fuel	Natural and imported gas	Hydro, nuclear, imported electricity	Total energy: Aggregate[1]	Total energy: Per capita (kilograms)
Market economy:						
North America:						
1970	499	1,047	840	53	2,438	10,775
1971	464	1,086	872	58	2,480	10,840
1972	515	1,172	889	64	2,640	11,437
1973	512	1,230	878	70	2,689	11,560
1974	515	1,186	843	79	2,623	11,187
1975	548	1,153	789	85	2,576	10,888
Other America:						
1970	8	86	8	7	108	692
1971	8	93	9	7	117	727
1972	7	98	10	8	123	748
1973	7	107	11	9	135	800
1974	8	110	12	11	141	814
1975	8	112	13	12	145	813
Caribbean America:						
1970	7	89	31	4	130	1,067
1971	7	97	33	4	142	1,124
1972	8	102	34	4	148	1,142
1973	9	110	37	4	160	1,201
1974	9	116	39	5	168	1,226
1975	9	113	39	5	166	1,174
Western Europe:						
1970	448	770	101	47	1,367	3,858
1971	419	804	131	48	1,403	3,935
1972	379	851	168	52	1,450	4,039
1973	391	910	193	53	1,548	4,285
1974	389	862	220	58	1,529	4,207
1975	368	803	234	62	1,468	4,023
Africa:						
1970	59	45	2	3	109	308
1971	63	51	2	3	120	333
1972	64	55	3	4	125	337
1973	67	59	4	4	134	352
1974	70	62	5	4	142	363
1975	75	70	9	5	158	395
Near East:						
1970	7	47	28	1	83	792
1971	7	54	28	1	90	837
1972	7	59	30	1	98	885
1973	8	68	35	1	111	979
1974	8	73	37	1	120	1,026
1975	8	78	38	2	127	1,055

See footnotes at end of table.

Table 14.—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 fuel	Natural and imported gas	Hydro, nuclear, imported electricity	Total energy: Aggregate [1]	Total energy: Per capita (kilograms)
Market economy—Continued						
Far East:						
1970	180	334	14	16	544	491
1971	172	371	17	17	577	509
1972	170	398	20	18	606	524
1973	178	446	25	16	666	563
1974	191	432	30	20	672	556
1975	200	419	33	21	674	545
Oceania:						
1970	35	39	2	3	78	4,055
1971	35	41	3	3	82	4,158
1972	36	42	4	3	86	4,269
1973	37	46	6	3	92	4,520
1974	40	48	6	4	98	4,722
1975	42	48	7	4	101	4,782
Total market economy:						
1970	1,243	2,457	1,026	134	4,857	1,987
1971	1,175	2,597	1,095	141	5,011	2,012
1972	1,186	2,777	1,158	154	5,276	2,074
1973	1,209	2,976	1,189	160	5,535	2,137
1974	1,230	2,889	1,192	182	5,493	2,077
1975	1,258	2,796	1,162	196	5,415	2,009
Centrally planned economy:						
Europe: [3]						
1970	768	437	317	17	1,540	4,425
1971	786	469	347	18	1,619	4,613
1972	808	510	365	18	1,700	4,803
1973	815	555	389	18	1,777	4,980
1974	819	590	415	20	1,845	5,126
1975	849	630	467	20	1,965	5,412
Asia: [4]						
1970	389	41	2	5	436	536
1971	421	52	3	5	481	581
1972	434	59	3	6	502	596
1973	468	66	4	6	543	635
1974	491	80	4	6	581	668
1975	514	99	5	7	625	706
Total centrally planned economy:						
1970	1,157	478	319	22	1,976	1,700
1971	1,207	521	350	23	2,100	1,781
1972	1,242	569	368	24	2,202	1,840
1973	1,283	620	393	24	2,320	1,915
1974	1,310	670	419	26	2,426	1,973
1975	1,363	729	471	26	2,590	2,075
World total:						
1970	2,400	2,935	1,345	156	6,833	1,895
1971	2,382	3,118	1,445	164	7,111	1,938
1972	2,428	3,346	1,526	178	7,478	1,999
1973	2,492	3,596	1,582	184	7,855	2,066
1974	2,540	3,559	1,611	208	7,919	2,043
1975	2,621	3,525	1,633	222	8,005	2,030

[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 except for "Total market economy," which is the sum of individual market economy areas. In some cases, totals may not represent the sum of listed parts because of rounding and/or ommission 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 footnote.

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

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

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

Source: United Nations. World Energy Supplies 1971–1975. Statistical Papers, ser. J, No. 20, New York, 1977, pp. 2–9.

Table 15.—Annual investment expenditure in the steel industry for selected countries

(Million dollars)

Country or country group	1973	1974
EEC	3,028	2,799
EFTA	439	452
Other countries:		
Australia	131	92
Canada	238	373
Finland	36	65
Japan	2,033	2,795
Spain	239	NA
Turkey	180	206
United States	1,400	2,104

NA Not available.

Source: Organization for Economic Cooperation and Development. The Iron and Steel Industry in 1974 and Trends in 1975. P. 56.

Table 16.—Market economy country petroleum capital expenditures and exploration expenses, by geographic area

(Million dollars)

Area and type of expenditure	1973	1974	1975
United States:			
Capital expenditures	10,640	16,625	17,725
Exploration expenses	850	1,130	1,195
Total	11,490	17,755	18,920
Other Western Hemisphere:			
Capital expenditures	3,305	4,945	5,775
Exploration expenses	275	405	380
Total	3,580	5,350	6,155
Western Europe:			
Capital expenditures	4,825	6,920	9,050
Exploration expenses	175	225	300
Total	5,000	7,145	9,350
Africa:			
Capital expenditures	975	1,215	1,675
Exploration expenses	125	150	200
Total	1,100	1,365	1,875
Near East:			
Capital expenditures	1,390	1,770	2,025
Exploration expenses	50	50	50
Total	1,440	1,820	2,075
Far East:			
Capital expenditures	2,410	3,525	4,360
Exploration expenses	225	225	200
Total	2,635	3,750	4,560
Unspecified: Capital expenditures (no exploration expenses)	6,450	8,700	9,015
Total:			
Capital expenditures	29,995	43,700	49,625
Exploration expenses	1,700	2,185	2,325
Grand total	31,695	45,885	51,950

Source: Energy Division, Chase Manhattan Bank. N. A. Capital Investments of the World Petroleum Industry, 1975. Pp. 14–19.

Table 17.—Market economy country petroleum industry capital expenditures, by industry sector, and exploration expenses

(Million dollars)

	1973	1974	1975
Capital expenditures:			
Production:			
Crude oil and natural gas	12,415	18,765	18,295
Natural gasoline plants	510	770	960
Pipelines	1,230	2,460	5,995
Marine	6,550	8,900	9,240
Refineries	4,865	7,720	8,725
Marketing	2,480	2,215	2,160
Chemical plants	1,175	1,995	3,145
Other	770	875	1,105
Total	29,995	43,700	49,625
Exploration expenses	1,700	2,185	2,325
Grand total	31,695	45,885	51,950

Source: Energy Division, Chase Manhattan Bank. N. A. Capital Investments of the World Petroleum Industry, 1975. Pp. 14–15.

Table 18.—U.S. direct foreign investment in mineral industries: Value, earnings, and income

(Million dollars)

Area and country	Mining, smelting, refining			Petroleum		
	Value	Earnings [1]	Income [2]	Value	Earnings [1]	Income [2]
1972	7,110	419	395	26,263	3,311	2,826
1973	6,038	617	497	27,313	6,128	4,249
1974:						
Canada	2,794	209	125	5,731	782	252
Latin America and other Western Hemisphere:						
Latin American Republics:						
Chile	25	5	4	NA	NA	(3)
Peru	412	69	68	239	—50	—48
Venezuela	21	NA	NA	659	332	333
Other	271	145	107	1,138	264	175
Subtotal [4]	729	219	179	2,036	546	460
Other Western Hemisphere	402	102	102	1,528	216	207
Total	1,131	321	281	3,564	762	667
Europe:						
EEC:						
Denmark and Ireland	2	(3)	(3)	504	24	—26
United Kingdom	NA	(3)	(3)	2,956	90	—49
Other [5]	NA	—2	—1	4,805	547	417
Subtotal [4]	NA	—2	—1	8,265	661	342
Other Western Europe	NA	—5	—4	1,695	133	17
Total	37	—7	—5	9,960	794	359
Africa:						
Republic of South Africa	NA	37	30	NA	NA	NA
Other	439	NA	NA	1,346	920	732
Total [4]	439	37	30	1,346	920	732
Near East	3	--	--	1,613	8,431	8,420
Far East and Pacific:						
Japan	--	--	--	1,367	99	23
Australia	952	187	129	781	NA	NA
New Zealand	NA	1	1	NA	NA	—1
Other	211	NA	NA	1,734	1,011	859
Total [4]	1,163	188	NA	3,882	1,110	881
International shipping	--	--	--	3,605	418	238
Grand total [6]	5,790	868	680	30,195	13,433	11,714

See footnotes at end of table.

Table 18.—U.S. direct foreign investment in mineral industries: Value, earnings, and income—Continued

(Million dollars)

Area and country	Mining, smelting, refining			Petroleum		
	Value	Earnings [1]	Income [2]	Value	Earnings [1]	Income [2]
1975:						
Canada	3,058	256	100	6,209	845	311
Latin America and other Western Hemisphere:						
Latin American Republics:						
Chile	13	NA	(3)	NA	NA	(3)
Peru	700	NA	−26	242	NA	−98
Venezuela	NA	1	1	861	161	174
Other	299	32	25	1,092	42	78
Subtotal [4]	1,012	33	(3)	2,195	203	154
Other Western Hemisphere	460	86	86	1,175	141	102
Total	1,472	119	86	3,370	344	256
Europe:						
EEC:						
Denmark and Ireland	2	(3)	(3)	424	−27	−21
United Kingdom	11	(3)	(3)	3,840	42	−53
Other [5]	1	−3	−1	5,282	464	412
Subtotal [4]	14	−3	−1	9,546	479	338
Other Western Europe	27	(3)	(3)	1,835	91	38
Total	41	−3	−1	11,381	570	376
Africa:						
Republic of South Africa	NA	9	7	405	NA	NA
Other	486	NA	NA	1,337	417	278
Total [4]	486	9	7	1,742	417	278
Near East	5	2	(3)	3,673	2,364	2,336
Far East and Pacific:						
Japan	--	--	--	1,314	45	12
Australia	1,063	230	189	888	NA	NA
New Zealand	NA	1	1	139	−1	(3)
Other	181	NA	NA	2,766	780	−122
Total [4]	1,244	231	190	5,107	824	−110
International shipping	--	--	--	3,324	84	81
Grand total [6]	6,551	680	442	34,806	5,658	3,657

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 listed as not reported.
[5] Includes Belgium, Luxembourg, France, West 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. 56, No. 8, August 1976, pp. 40–60.

Table 19.—World merchant fleet distribution, by type [1]

	1971	1972	1973	1974	1975
Number of vessels:					
Tankers	4,431	4,581	4,813	5,121	5,311
Bulk carriers	3,218	3,539	3,800	4,075	4,272
Freighters	11,095	11,087	11,170	11,449	[2] 12,575
Other	1,800	1,802	1,817	1,804	[3] 714
Total	20,544	21,009	21,600	22,449	22,872
Gross tonnage:					
Tankers thousand tons	99,105	108,558	122,370	143,399	163,731
Bulk carriers do	55,009	64,822	74,660	82,313	88,194
Freighters do	64,038	65,179	66,790	68,855	[2] 75,284
Other do	12,150	11,984	11,907	11,799	[3] 5,833
Total do	230,302	250,543	275,727	306,366	333,042
Deadweight tonnage:					
Tankers do	173,196	192,894	220,481	261,440	302,217
Bulk carriers do	90,962	108,512	126,140	139,267	150,080
Freighters do	88,305	88,970	90,511	93,476	[2] 101,248
Other do	9,276	9,176	9,238	9,165	[3] 3,027
Total do	361,739	399,552	446,370	503,348	556,572

[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, except as otherwise indicated. Contribution of these vessels to mineral commodity trade is regarded as unimportant. Data are as of December 31 of year indicated.
[2] Figures include refrigerated freighters.
[3] Figures exclude refrigerated freighters.

Source: U.S. Department of Commerce, Maritime Administration. Merchant Fleets of the World. September 1976, 43 pp.

Table 20.—World shipping (tanker and dry cargo) loadings and unloadings

(Million metric tons)

	1971	1972	1973 r	1974 r	1975
Loaded:					
Tanker cargo	1,526	1,654	1,873	1,808	1,742
Dry cargo	1,173	r 1,247	1,403	1,509	1,433
Total	2,699	r 2,901	3,276	3,317	3,175
Unloaded:					
Tanker cargo	1,505	r 1,643	1,862	1,793	1,640
Dry cargo	1,144	r 1,223	1,376	1,463	1,441
Total	2,649	r 2,866	3,238	3,256	3,081

r Revised.

Source: United Nations. Monthly Bulletin of Statistics. V. 31, No. 1, January 1977, p. xxiii.

Table 21.—World shipping of tanker cargo, by region

(Million metric tons)

Region	Loadings 1971	Loadings 1972	Loadings 1973	Loadings 1974	Loadings 1975	Unloadings 1971	Unloadings 1972	Unloadings 1973	Unloadings 1974	Unloadings 1975
Developed market economies:										
Australia and New Zealand	2	2	3	3	5	17	16	16	17	15
Canada	2	5	7	7	6	18	24	25	22	23
Japan	1	2	1	2	2	223	245	273	268	247
South Africa, Republic of	--	--	--	--	--	16	14	15	14	23
United States	4	3	3	2	--	174	206	275	270	245
Western Europe	98	115	123	109	114	737	796	853	809	715
Other	13	22	27	40	27	12	20	25	29	20
Total	120	149	164	163	154	1,197	1,321	1,482	1,429	1,288
Developing market economies:										
Caribbean	63	60	74	67	69	100	99	119	111	110
Far East	64	79	92	90	94	91	100	118	107	101
Near East	762	855	1,001	1,031	961	12	15	16	17	19
North Africa	183	165	166	127	131	17	8	9	9	11
Other Africa	84	103	18	130	110	15	15	17	15	17
Venezuela	169	163	164	146	121	--	--	--	--	--
Other Latin America	9	11	20	15	19	48	50	62	61	61
Other	1	1	101	(1)	--	2	4	3	16	2
Total	1,335	1,437	1,636	[1] 1,571	1,505	285	291	344	336	321
Centrally planned economies:										
U.S.S.R	68	63	69	70	72	5	8	13	4	6
Other	3	4	4	4	11	18	19	23	24	22
Total	71	67	73	74	83	23	27	36	28	28

[1] As reported in source. Sum of reported detail exceeds reported total by 35 million tons. Reason for discrepancy is unaccounted for.

Source: United Nations. Monthly Bulletin of Statistics. V. 31, No. 1, January 1977, pp. xxiii–xxvi.

Table 22.—World shipping of dry cargo, by region

(Million metric tons)

Region	Loadings 1971	Loadings 1972	Loadings 1973	Loadings 1974	Loadings 1975	Unloadings 1971	Unloadings 1972	Unloadings 1973	Unloadings 1974	Unloadings 1975
Developed market economies:										
Australia and New Zealand	115	121	149	166	169	16	16	21	24	23
Canada	94	94	105	99	96	37	38	41	39	41
Japan	51	52	55	65	68	238	277	315	329	302
South Africa, Republic of	15	18	19	19	22	7	7	7	11	9
United States	182	207	247	244	246	133	135	147	155	164
Western Europe	240	265	308	329	280	449	469	534	574	521
Other	4	1	1	(1)	1	5	4	6	1	9
Total	701	758	884	[1] 911	882	885	946	1,071	1,133	1,069
Developing market economies:										
Caribbean	29	27	30	28	23	13	14	14	13	15
Far East	98	102	121	117	114	80	80	89	102	105
Near East	9	13	9	11	8	24	23	28	36	37
North Africa	28	29	29	34	28	20	20	23	31	33
Other Africa	74	73	81	79	78	25	23	21	15	17
Venezuela	27	18	23	28	28	4	5	5	6	6
Other Latin America	109	103	125	146	157	32	38	45	49	52
Other	9	6	7	46	12	3	2	5	2	11
Total	383	371	425	489	448	201	205	230	254	276
Centrally planned economies:										
U.S.S.R	45	46	44	48	48	10	22	24	18	29
Other	44	46	50	61	55	48	48	51	58	65
Total	89	92	94	109	103	58	70	75	76	94

[1] As reported in source. Sum of reported detail exceeds reported total by 11 million tons. Reason for discrepancy is unaccounted for.

Source: United Nations. Monthly Bulletin of Statistics. V. 31, No. 1, January 1977, pp. xxiii–xxvi.

Table 23.—Distribution of world oil tanker tonnage, by size group

Size group (deadweight tons)	1966		1975			
			In service		New construction in progress or on order at yearend	
	Million deadweight tons	Percent of total	Million deadweight tons	Percent of total	Million deadweight tons [1]	Percent of total
Under 25,000 [2]	30.0	30.2	19.7	6.8	0.9	1.0
25,000–45,000	25.3	25.5	28.9	9.9	4.8	5.4
45,000–65,000	21.2	21.3	21.9	7.5	2.0	2.3
65,000–125,000	21.8	21.9	51.4	17.7	9.3	10.5
125,000–205,000	1.1	1.1	23.3	8.0	12.9	14.6
205,000–285,000	--	--	126.0	43.2	26.2	29.6
285,000 and over	--	--	20.2	6.9	32.4	36.6
Total	99.4	100.0	[3] 291.4	100.0	88.5	100.0

[1] Excludes 7.4-million-deadweight-ton combined carriers.
[2] Includes vessels 2,000 deadweight tons and over for 1966 and 10,000 deadweight tons and over for 1975.
[3] Data differ slightly from total given in table 19 because of difference in source.

Source: British Petroleum Co. Ltd. BP Statistical Review of the World Oil Industry. Bayard Press, London. 1966, p. 15; 1975, p. 14.

Table 24.—Indexes of ocean freight rates

(1970=100)

Year and quarter	Trip charter									
	West Germany	Norway						Centrally planned economy countries [1]		
	Tankers	Tankers (deadweight tons)					Dry cargo	Tankers (deadweight tons)		
		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
1972	41	--	--	43	--	--	62	108	87	73
1973	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
1975: [2]										
First quarter	30	44	46	30	18	10	129	163	176	135
Second quarter	46	58	52	36	23	12	116	144	149	134
Third quarter	46	66	59	42	25	15	109	147	145	96
Fourth quarter	39	59	58	43	25	10	114	198	160	134
Annual average	40	54	51	36	22	11	119	175	162	128

	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
1972	--	r 84	88	85	89	88	--	r 70	57	48
1973	r 213	r 177	138	131	129	133	r --	r 144	150	r 129
1974:[2]										
First quarter	286	250	169	155	135	128	91	207	185	147
Second quarter	256	222	162	150	133	118	90	222	r 200	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
1975:[2]										
First quarter	143	158	100	100	90	79	66	143	103	67
Second quarter	91	114	102	102	92	78	66	124	67	33
Third quarter	94	122	110	104	95	81	67	119	88	35
Fourth quarter	121	132	99	97	86	74	59	141	115	45
Annual average	121	137	105	103	92	79	66	132	93	45

r Revised.
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 those of United Kingdom dry cargo, which are averages for the quarter indicated.
3 Index numbers represent the trip/time charter of the average freight rate assessments calculated on the basis of rates prevailing during the period.
Source: United Nations. Monthly Bulletin of Statistics. V. 29, No. 9, September 1975, p. xviii; and V. 30, No. 6, June 1976, p. xxlx.

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

	Tankers	Container cargo ships	Dry bulk carriers	General cargo ships	Other	Total
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 [r]	20,130	4,529	51,591	15,213	1,335	92,798
Pacific to Atlantic [r]	13,167	5,365	22,880	13,124	2,947	57,483
Total [r]	33,297	9,894	74,471	28,337	4,282	150,281
1975						
Number of transits:						
In ballast:						
Atlantic to Pacific	92	2	153	86	708	1,041
Pacific to Atlantic	551	6	169	190	117	1,033
Total	643	8	322	276	825	2,074
Laden:						
Atlantic to Pacific	849	499	1,873	1,801	687	5,709
Pacific to Atlantic	417	557	1,557	1,868	1,427	5,826
Total	1,266	1,056	3,430	3 669	2.114	11.535
In ballast and laden:						
Atlantic to Pacific	941	501	2,026	1,887	1,395	6,750
Pacific to Atlantic	968	563	1,726	2,058	1,544	6,859
Grand total	1,909	1,064	3,752	3,945	2,939	13,609
Cargo moved (thousand metric tons):						
Atlantic to Pacific	16,741	3,727	53,266	10,459	1,249	85,442
Pacific to Atlantic	8,351	5,884	27,083	12,486	3,104	56,908
Total	25,092	9,611	80,349	22,945	4,353	142,350

[r] Revised.

Source: Panama Canal Co. Annual Reports for fiscal years ending June 30, 1974, and June 30, 1975.

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

(Thousand metric tons)

Commodity	Atlantic to Pacific			Pacific to Atlantic			Total		
	1973	1974	1975	1973	1974	1975	1973	1974	1975
METALS									
Aluminum:									
Bauxite and alumina	1,593	1,071	1,174	576	671	414	2,169	1,742	1,588
Metal, except scrap	59	76	41	90	51	75	149	127	116
Chromium, chromite	96	53	77	185	247	195	281	300	272
Copper:									
Ore and concentrate	46	36	12	557	669	535	603	705	547
Metal, except scrap	17	17	21	541	402	739	558	419	760
Iron and steel:									
Iron ore	212	591	324	2,134	2,384	3,290	2,346	2,975	3,614
Pig iron, steel ingots, other crude forms, except scrap	143	221	428	20	71	225	163	292	653
Semimanufactures (excluding tinplate)	1,796	2,085	1,733	7,993	6,845	9,684	9,789	8,930	11,417
Lead:									
Ore and concentrate	3	6	12	136	194	121	139	200	133
Metal, except scrap	6	15	4	202	168	209	208	183	213
Manganese ore and concentrate	203	172	254	116	146	273	319	318	527
Tin:									
Ore and concentrate	3	2	4	78	61	77	81	63	81
Metal (including tinplate)	122	135	100	134	107	141	256	242	241
Zinc:									
Ore and concentrate	255	262	159	530	726	693	785	988	852
Metal, except scrap	9	28	7	147	81	120	156	109	127
Other and unclassified:									
Ore and concentrate	118	144	250	765	995	920	883	r 1,139	1,170
Metal, except scrap	59	75	60	213	r 147	337	272	r 222	397
Metal scrap, all metals	3,286	3,512	2,175	17	r 39	51	3,303	r 3,551	2,226
NONMETALS									
Asbestos	123	81	53	54	63	38	177	144	91
Borax	4	7	7	457	444	491	461	451	498
Cement	120	145	181	42	17	23	162	162	204
Clays and clay products:									
Fire clay and kaolin	281	338	229	31	26	10	312	364	239
Brick and tile	64	75	89	149	98	55	213	173	144
Diatomaceous earth	9	6	6	48	33	21	57	39	27
Fertilizer materials:									
Nitrogenous:									
Ammonia compounds	368	568	600	28	50	168	396	618	768
Sodium nitrate	33	43	29	304	288	358	337	331	387
Phosphatic	4,655	5,278	5,347	3	1	89	4,658	5,279	5,436
Potassic	345	274	295	498	620	479	843	894	774
Unclassified	1,114	1,371	1,199	138	146	117	1,252	1,517	1,316

See footnote at end of table.

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

(Thousand metric tons)

Commodity	Atlantic to Pacific			Pacific to Atlantic			Total		
	1973	1974	1975	1973	1974	1975	1973	1974	1975
NONMETALS—Continued									
Sodium compounds:									
Salt	108	83	130	439	101	186	547	184	316
Caustic soda	462	642	587	3	11	106	465	653	693
Other	106	119	91	14	5	46	120	124	137
Stone including marble	41	75	46	1	2	1	42	77	47
Sulfur	352	501	226	755	940	1,148	1,107	1,441	1,374
Other, slag, dross, and similar waste, not metal bearing	59	46	88	76	39	78	135	85	166
MINERAL FUELS AND RELATED MATERIALS									
Carbon black	23	29	15	4	2	4	27	31	19
Coal and coke	13,864	18,526	25,186	361	629	1,539	14,225	19,155	26,725
Petrochemicals	435	564	276	259	426	391	694	990	667
Petroleum:									
Crude	4,622	6,218	6,500	7,159	10,899	4,527	11,781	17,117	11,027
Refinery products	8,461	12,329	9,466	3,093	3,033	3,795	11,554	15,362	13,261
Total	r 43,675	r 55,819	57,481	r 28,350	r 31,877	31,769	r 72,025	r 87,696	89,250

r Revised.

Source: Panama Canal Co. 1975 Annual Report. Pp. 54–57.

Table 27.—Commercial ocean traffic through the Suez Canal, by number of transits and type of vessel for 1975[1]

	Tankers	Combination carriers	Container cargo ships	Dry bulk carriers	General cargo ships	Other	Total
In ballast:							
Southbound	236	2	--	14	62	45	359
Northbound	40	--	2	12	430	34	518
Total	276	2	2	26	492	79	877
Laden:							
Southbound	110	6	7	168	1,803	83	2,177
Northbound	181	--	15	103	1,178	46	1,523
Total	291	6	22	271	2,981	129	3,700
In ballast and laden:							
Southbound	346	8	7	182	1,865	128	2,536
Northbound	221	--	17	115	1,608	80	2,041
Grand total	567	8	24	297	3,473	208	4,577

[1] Data are for 6 months.

Source: Arab Republic of Egypt. Suez Canal Report. Monthly issues June–December 1975.

Table 28.—Movement of mineral commodities through the Suez Canal, by commodity and direction of movement for 1975[1]

(Thousand metric tons)

Commodity	Southbound	Northbound	Total
METALS			
Aluminum, bauxite	--	33	33
Chromium, metal and ores	--	125	125
Copper, metal and ores	--	70	70
Iron and steel:			
Iron ore	--	836	836
Metal:			
Pig iron	64	--	64
Plates and sheets	277	--	277
Lead, metal and ores	--	78	78
Manganese ore and concentrate	--	193	193
Tin, metal and ores	--	22	22
Titanium ore and concentrate	--	109	109
Zinc, metal and ores	--	106	106
Other metals and ores, n.e.s	548	149	697
NONMETALS			
Cement	1,865	5	1,870
Fertilizer materials:			
Nitrogenous	381	--	381
Phosphatic	770	--	770
Potassic	149	--	149
Unclassified	1,548	374	1,922
Salt	13	--	13
Other, unspecified	97	142	239
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke	76	252	328
Petroleum:			
Crude oil	91	2,192	2,283
Refinery products	2,107	2,138	4,245
Total	7,986	6,824	14,810

[1] Data are for 6 months.

Source: Arab Republic of Egypt. Suez Canal Report. Monthly issues June–December 1975.

Table 29.—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]
1973	25.000	58.865	16.285	20.658	227.558	255.339
1974	34.133	76.640	22.533	35.945	399.266	470.798
1975:						
January	39.000	68.403	24.500	39.153	363.761	419.250
February	39.000	63.555	24.500	39.109	372.066	435.684
March	39.000	63.555	24.500	38.951	366.038	433.150
April	39.000	63.555	24.500	38.929	354.102	420.918
May	39.000	63.155	23.338	38.938	342.536	453.810
June	39.000	62.511	19.000	38.944	342.476	448.914
July	39.000	61.859	19.000	38.917	333.216	470.455
August	40.429	63.165	19.557	38.902	331.821	492.510
September	41.000	63.165	20.000	38.886	322.774	451.595
October	41.000	63.165	20.000	38.955	321.946	432.886
November	41.000	63.165	20.000	38.897	324.026	433.244
December	41.000	63.165	19.455	38.931	303.071	408.486
Average	39.786	63.535	21.529	38.959	339.818	441.852

[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. Nonferrous Metal Data, 1975. New York, 1976, 143 pp.

Table 30.—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]
1973	26.326	80.805	19.382	38.314	218.148	254.370
1974	34.690	93.097	26.801	55.973	371.391	470.600
1975:						
January	40.570	54.940	24.383	36.181	348.976	422.840
February	41.140	57.504	24.559	35.978	342.508	439.517
March	41.540	60.852	24.607	36.394	334.720	438.173
April	40.710	60.309	21.727	35.462	323.507	418.708
May	41.680	56.841	19.108	33.838	312.789	463.170
June	40.960	54.071	15.986	34.005	314.140	448.697
July	39.240	55.446	16.266	32.041	307.994	469.397
August	37.980	57.928	17.380	33.385	306.030	492.642
September	37.420	54.859	16.323	32.786	296.373	448.757
October	36.940	53.496	15.620	31.983	287.369	428.534
November	36.790	53.461	15.274	31.949	283.872	431.577
December	38.520	52.205	15.098	31.083	280.357	408.941
Average	39.460	56.110	18.681	33.792	311.627	441.746

[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. Nonferrous Metal Data, 1975. New York, 1976, 143 pp.

Table 31.—Nonferrous metal prices in Canada

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

Year and month	Copper [1]	Lead [2]	Zinc [2]	Silver [3]
1973	63.662	16.224	23.568	([4])
1974	79.487	20.774	34.381	460.126
1975:				
January	69.120	21.613	37.195	419.797
February	63.348	21.491	36.984	437.538
March	63.346	21.490	36.983	433.615
April	62.686	21.266	36.598	421.540
May	61.614	20.556	35.972	453.837
June	61.744	19.114	36.048	448.480
July	61.476	18.916	35.891	471.934
August	61.208	18.833	35.735	495.140
September	61.751	19.000	36.052	450.085
October	61.827	19.024	36.096	430.966
November	62.507	19.233	36.493	425.973
December	62.505	18.809	36.492	402.266
Average	62.761	19.945	36.378	440.931

[1] Electrolytic wirebar, f.o.b. delivered Canadian points.
[2] Pig lead, Prime Western zinc; producers' prices, carload quantities, communicated by Cominco Ltd.
[3] U.S. cents per troy ounce, average price of Cominco Ltd.
[4] No yearly average reported for 1973.

Source: American Bureau of Metal Statistics, Inc. Nonferrous Metal Data, 1975. New York, 1976, 143 pp.

Table 32.—Mineral commodity export price indexes

(1970=100)

Year and quarter	Metal ores	Fuels	All crude minerals
1973	130	189	173
1974	175	577	473
1975:			
First quarter	200	586	488
Second quarter	199	583	486
Third quarter	199	577	482
Fourth quarter	199	628	519
Annual average	200	588	494

Source: United Nations. Monthly Bulletin of Statistics. V. 30, No. 9, September 1976, pp. xxi–xxii.

Table 33.—Analysis of export price indexes

(1970=100)

Year and quarter	Developed areas		Developing areas	
	Total minerals	Nonferrous base metals	Total minerals	Nonferrous base metals
1973	150	119	182	127
1974	274	149	555	160
1975:				
First quarter	309	129	559	114
Second quarter	302	126	560	110
Third quarter	293	123	557	108
Fourth quarter	301	123	607	103
Annual average	301	125	571	109

Source: United Nations. Monthly Bulletin of Statistics. V. 30, No. 9, September 1976, pp. xxi–xxii.

Table 34.—Leading world producers of bauxite

(Gross weight, thousand metric tons)

Country	1973	1974	1975 p
Australia	17,596	20,065	21,003
Jamaica	13,600	15,328	11,571
Guinea e	r 3,048	r 6,604	9,100
Surinam	7,110	r e 6,706	e 4,928
U.S.S.R. e 1	4,300	4,300	4,400
Guyana	3,276	r e 3,251	e 3,251
Greece	r 2,748	2,783	3,244
Hungary	2,600	2,751	2,891
France	3,133	2,765	2,527
Yugoslavia	2,167	2,370	2,306
United States	1,909	1,980	1,806
India	1,292	1,113	1,270
Total	r 62,779	70,016	68,297
All others	r 7,605	8,067	6,823
Grand total	r 70,384	78,083	75,120

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

Table 35.—Leading world producers of aluminum

(Thousand metric tons)

Country	1973	1974	1975 p
United States	4,108	4,448	3,519
U.S.S.R. e	1,360	1,430	1,500
Japan	r 1,097	1,118	1,013
Canada	942	1,021	e 913
Germany, West	533	689	678
Norway	620	649	591
France	359	393	383
United Kingdom	252	294	308
Netherlands	190	252	261
Australia	207	219	214
Spain	162	191	210
Italy	184	212	190
Romania	141	187	190
Total	r 10,155	11,103	9,970
All others	r 1,968	2,069	2,072
Grand total	r 12,123	13,172	12,042

e Estimate. p Preliminary. r Revised.

Table 36.—Leading world producers of mine copper

(Copper content of ore, thousand metric tons)

Country	1973	1974	1975 p
United States 1	1,558	1,449	1,282
Chile	735	902	828
U.S.S.R. e 1 2	700	740	765
Canada 1	r 823	821	724
Zambia	707	698	677
Zaire	r 489	499	496
Poland	155	198	270
Philippines	221	225	227
Australia	220	251	218
Peru	r 203	212	179
South Africa, Republic of	176	179	179
Papua New Guinea	r 182	184	172
Total	r 6,169	6,358	6,017
All others	r 948	957	950
Grand total	r 7,117	7,315	6,967

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

Table 37.—Leading world producers of gold

(Thousand troy ounces)

Country	1971	1972	1973	1974	1975 p
South Africa, Republic of	31,389	29,245	27,495	24,388	22,938
U.S.S.R. e	6,700	6,900	7,100	7,300	7,500
Canada	2,243	2,079	1,954	1,698	1,674
United States	1,495	1,449	1,176	1,127	1,052
Papua New Guinea	24	409	e 643	693	592
Rhodesia, Southern	502	e 502	e 500	e 500	e 550
Ghana	698	724	723	567	524
Australia	627	755	554	522	514
Philippines	637	607	572	536	502
Total	44,360	42,670	40,717	37,331	35,846
All others	2,135	2,048	2 285	2,310	2,791
Grand total	46,495	44,718	43,002	39,641	38,637

e Estimate. p Preliminary.

Table 38.—Leading world producers of iron ore, iron ore concentrates, and iron ore agglomerates

(Thousand metric tons)

Country	1973	1974	1975 p
U.S.S.R	r 216,104	225,000	233,000
Australia	r 84,828	96,688	97,652
United States	89,076	85,709	80,132
Brazil	r 50,506	73,955	71,724
China, People's Republic of e	56,000	r 60,000	65,000
France	r 54,238	54,264	49,652
Canada	r 50,213	49,976	46,868
India	r 35,562	35,485	41,297
Sweden	r 34,727	36,153	32,639
Liberia	23,542	23,785	27,163
Venezuela	23,110	26,424	24,772
South Africa, Republic of	10,955	11,553	12,298
Chile	r 9,466	10,271	11,049
Korea, North e	8,900	9,400	9,400
Mauritania	10,480	11,666	8,686
Total	r 757,707	810,329	811,332
All others	r 88,065	85,045	80,260
Grand total	r 845,772	895,374	891,592

e Estimate. p Preliminary. r Revised.

Table 39.—Leading world producers of crude steel [1]

(Thousand metric tons)

Country	1973	1974	1975 p
U.S.S.R	r 131,454	136,000	141,000
United States	136,803	132,195	105,816
Japan	119,322	117,131	102,314
Germany, West	49,521	53,232	40,415
China, People's Republic of e	27,000	27,000	29,000
Italy	20,995	23,803	21,836
France	25,264	27,023	21,492
United Kingdom	26,649	22,426	20,200
Poland	14,057	14,565	15,007
Czechoslovakia	13,158	13,640	14,315
Canada	13,386	13,623	13,025
Belgium	r 15,527	16,230	11,587
Spain	r 10,808	11,646	11,488
Romania	8,161	8,840	9,400
Australia	7,684	7,755	7,814
Total	r 619,789	625,109	564,709
All others	r 77,684	82,269	81.707
Grand total	r 697,473	707,378	646,416

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

Table 40.—Leading world producers of mine lead

(Lead content of ore, thousand metric tons)

Country	1973	1974	1975 p
United States 1	547	602	564
U.S.S.R.e	470	475	480
Australia	r 403	375	407
Canada	388	320	e 358
Peru 1	r 183	202	204
Mexico 1	179	218	179
Yugoslavia	119	120	132
Bulgaria e	105	r 110	112
China, People's Republic of e	100	100	100
Korea, North e	90	r 100	100
Total	r 2,584	2,622	2,636
All others	r 901	854	802
Grand total	r 3,485	3,476	3,438

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

Table 41.—Leading world producers of manganese ore

(Gross weight, thousand metric tons)

Country	1973	1974	1975 p
U.S.S.R.	8,245	8,500	8,800
South Africa, Republic of	4,176	4,745	5,769
Gabon	1,919	2,064	2,230
Brazil	r 1,615	1,789	e 1,630
Australia	1,522	1,522	1,555
India	r 1,489	1,447	1,531
China, People's Republic of e	1,000	1,000	1,000
Mexico	364	403	428
Ghana	318	250	415
Zaire	334	288	309
Total	r 20,982	22,008	23,667
All others	r 765	735	732
Grand total	r 21,747	22,743	24,399

e Estimate. p Preliminary. r Revised.

Table 42.—Leading world producers of mine nickel

(Thousand metric tons)

Country	1971	1972	1973	1974	1975 p
Canada	267	235	244	269	245
U.S.S.R.e	120	125	135	145	152
New Caledonia	101	89	107	135	133
Australia	36	36	41	43	75
Cuba e	35	32	36	36	37
Dominican Republic	(1)	17	30	31	31
Total	559	534	593	659	673
All others	80	78	117	132	145
Grand total	639	612	710	791	818

e Estimate. p Preliminary.
1 Less than ½ unit.

Table 43.—Leading world producers of mine tin

(Tin content of ore, metric tons)

Country	1973	1974	1975 p
Malaysia	72,262	68,124	64,364
U.S.S.R.e	29,000	29,500	30,000
Bolivia	r 30,318	29,498	28,744
Indonesia	22,297	25,021	24,391
China, People's Republic of e	20,000	20,000	22,000
Thailand	20,921	20,339	16,406
Australia	r 10,801	10,114	9,678
Nigeria	5,828	5,455	4,652
Total	r 211,427	208,051	200,235
All others	r 26,420	25,696	24,960
Grand total	r 237,847	233,747	225,195

e Estimate. p Preliminary. r Revised.

Table 44.—Leading world producers of mine zinc

(Zinc content of ore, thousand metric tons)

Country	1973	1974	1975 p
Canada	1,227	1,160	1,083
U.S.S.R.e	670	680	690
Australia	r 480	456	e 492
United States	434	453	426
Peru	r 412	370	360
Japan	264	241	258
Mexico	271	263	229
Poland	210	200	216
Korea, North e	160	162	162
Germany, West	123	116	e 116
Sweden	119	114	110
Yugoslavia	97	95	e 101
China, People's Republic of e	100	100	100
Greenland	27	105	91
Spain	r 87	85	84
Total	r 4,681	4,600	4,518
All others	r 1,029	1,099	1,045
Grand total	r 5,710	5,699	5,563

e Estimate. p Preliminary. r Revised.

Table 45.—Leading world producers of hydraulic cement

(Thousand metric tons)

Country	1973	1974	1975 p
U.S.S.R	109,500	115,000	122,000
Japan	78,118	73,108	65,519
United States	79,445	75,195	63,251
Italy	36,312	36,309	34,235
Germany, West	r 41,011	35,977	33,516
China, People's Republic of e	25,000	r 25,000	30,000
France	30,713	32,469	29,249
Spain (including Canary Islands)	r 22,368	23,664	23,976
Poland	15,548	16,765	18,552
United Kingdom	19,986	17,781	16,896
Brazil	13,398	14,920	e 16,700
India	15,006	14,263	16,234
Romania	9,848	11,195	e 12,000
Mexico	9,787	10,595	11,612
Turkey	r 8,946	10,234	10,740
Germany, East	9,548	10,092	10,656
Korea, Republic of	8,175	8,842	10,129
Total	r 532.709	531,409	525,265
All others	r 169,226	172,558	179,073
Grand total	r 701,935	703,967	695,338

e Estimate. p Preliminary. r Revised.

Table 46.—Leading world producers of diamond [1]

(Thousand carats)

Country	1971	1972	1973	1974	1975 p
Zaire	12,743	13,390	12,940	13,611	12,810
U.S.S.R.e	8,800	9,200	9,500	9,500	9,700
South Africa, Republic of	7,031	7,395	7,565	7,510	7,295
Botswana	822	2,403	2,416	2,718	2,414
Ghana	2,562	2,659	2,307	2,572	2,328
South-West Africa, Territory of	1,648	1,596	1,600	1,570	1,748
Total	33,606	36,643	36,328	37,481	36,295
All others	7,761	7,167	6,739	7,041	4,831
Grand total	41,367	43,810	43,067	44,522	41,126

e Estimate. p Preliminary.
1 Gem and industrial grades, undifferentiated.

Table 47.—Leading world producers of nitrogen fertilizer compounds [1]

(Thousand metric tons of contained nitrogen)

Country	1973	1974	1975 p
United States	8,433	9,158	8,621
U.S.S.R	6,551	7,241	7,856
China, People's Republic of e	r 2,020	r 2,570	2,840
Japan	r 2,199	2,138	2,341
France	r 1,477	1,642	1,694
Germany, West	1,471	1,473	1,574
Poland	r 1,148	1,365	1,458
Netherlands	r 1,217	1,201	1,289
India	1,054	1,050	1,187
Italy	r 1,045	1,129	1,131
Romania	874	854	980
United Kingdom	751	756	885
Total	r 28,240	30,577	31,856
All others	r 9,603	9,895	10,332
Grand total	r 37,843	40,472	42,189

e Estimate. p Preliminary. r Revised.
1 Year ending June 30 of that stated.

Table 48.—Leading world producers of phosphate rock [1]

(Thousand metric tons)

Country	1973	1974	1975 p
United States	38,226	41,446	44,285
U.S.S.R.e 2	21,250	r 22,505	24,120
Morocco	17,077	19,721	13,548
Tunisia	r 3,474	3,826	3,488
China, People's Republic of e	3,000	3,000	3,400
Spanish Sahara	696	2,386	2,682
Total	r 83,723	92,884	91,523
All others	r 15,028	17,955	16,125
Grand total	r 98,751	110,839	107,648

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 49.—Leading world producers of marketable potash

(Thousand metric tons K_2O equivalent)

Country	1973	1974	1975 p
U.S.S.R	r 5,633	5,917	6,050
Canada	4,454	5,776	4,850
Germany, East	2,556	2,864	e 2,900
Germany, West	2,548	2,620	2,372
United States	2,361	2,315	2,269
France	2,263	2,276	1,892
Total	r 19,815	21,768	20,333
All others	1,960	1,988	2,031
Grand total	r 21,775	23,756	22,364

e Estimate. p Preliminary. r Revised.

Table 50.—Leading world producers of salt

(Thousand metric tons)

Country	1973	1974	1975 p
United States (including Puerto Rico)	39,862	42,243	37,246
China, People's Republic of e	r 20,000	r 25,000	30,000
U.S.S.R. e	12,200	12,500	13,000
Germany, West	10,201	11,320	8,440
United Kingdom	r 10,518	8,421	e 8,400
India	r 6,864	5,916	6,400
Mexico	4,319	5,470	e 6,000
France	6,371	6,272	5,538
Canada	5,048	5,447	5,156
Australia	r 4,116	4,935	e 5,000
Italy	4,872	4,894	4,411
Romania	3,296	3,923	3,831
Poland	r 3,078	3,295	3,513
Netherlands	3,044	3,387	2,690
Germany, East	2,286	2,338	e 2,400
Spain	r 2,197	2,257	e 2,300
Brazil	1,855	1,552	e 1,500
Bahamas	1,121	1,027	1,232
Argentina	699	956	1,151
Japan	1,015	1,115	1,012
Colombia	r 1,330	875	926
Total	r 144,292	153,143	150,146
All others	r 10,410	11,649	11,862
Grand total	r 154,702	164,792	162,008

e Estimate. p Preliminary. r Revised.

Table 51.—Leading world producers of sulfur [1]

(Thousand metric tons of contained sulfur)

Country	1973				1974				1975 [p]			
	Native	From pyrite	By-product	Total	Native	From pyrite	By-product	Total	Native	From pyrite	By-product	Total
United States	[2] 7,727	215	3,153	[r] 11,095	[2] 8,027	165	3,410	11,602	[2] 7,326	242	3,872	11,440
U.S.S.R. [e]	2,300	3,500	1,850	[r] 7,650	2,400	3,600	1,900	[r] 7,900	2,500	3,700	2,000	8,200
Canada	--	12	8,115	8,127	--	24	7,842	7,866	--	9	7,538	7,547
Poland	[3] 3,545	--	256	3,801	[3] 4,093	--	280	4,373	[3] 4,761	--	280	5,041
Japan	16	569	2,182	2,767	16	396	2,396	2,808	16	539	1,865	2,420
Mexico	[2] 1,608	--	64	1,672	[2] 2,323	--	64	2,387	[2] 2,164	--	91	2,255
France	--	--	1,856	1,856	--	--	1,946	1,946	--	--	1,921	1,921
Spain	--	1,113	113	[r] 1,226	--	1,308	[e] 113	1,421	--	1,310	[e] 113	1,423
China, People's Republic of [e]	130	900	120	1,150	130	900	120	1,150	130	900	120	1,150
Finland	123	357	376	856	100	340	386	826	[e] 100	[e] 340	[e] 438	[e] 878
Italy	80	778	[e] 310	[r] 1,168	61	473	[e] 311	845	[e] 43	500	[e] 295	838
Iraq	[2] 395	--	[e] 140	535	[2] 610	--	[e] 140	750	[2] 650	--	[e] 140	790
Germany, West	--	192	354	[r] 546	--	214	487	701	--	215	521	736
Iran	21	--	595	616	[e] 20	--	605	625	[e] 20	--	487	507
Australia	--	117	364	481	--	107	349	456	--	[e] 108	362	[e] 470
Total	[3] 15,945	7,753	19,848	[r] 43,546	[3] 17,780	7,527	20,349	45,656	[3] 17,710	7,863	20,043	45,616
All others	183	2,662	1.802	[r] 4.647	152	2,494	1,835	4,481	149	2,329	1,829	4,307
Grand total	[3] 16,128	10,415	21,650	[r] 48,193	[3] 17,932	10,021	22,184	50,137	[3] 17,859	10,192	21,872	49,923

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

[1] This table includes all recorded production of sulfur, regardless of its origin or of the form in which it is recovered. Thus it includes elemental sulfur, whether mined by conventional methods or by the Frasch process, as well as elemental sulfur and the sulfur content of compounds such as H_2S, SO_2 and H_2SO_4 recovered as a principal product of pyrite mining and as a byproduct of the recovery of crude oil and natural gas, and as a byproduct of oil refining, coal treatment, and metals smelting and/or refining.

[2] Entirely Frasch-process sulfur.

[3] Includes Frasch-process sulfur as follows, in thousand metric tons: Poland: 1973—2,975, 1974—3,274, 1975—3,817; total of individually listed countries and grand total: 1973—12,705, 1974—14,234, 1975—13,957. Balance is mined elemental sulfur.

Table 52.—Leading world producers of coal (all grades)

(Million metric tons)

Country	1973 Lignite	1973 Bituminous and anthracite	1973 Total	1974 Lignite	1974 Bituminous and anthracite	1974 Total	1975 p Lignite	1975 p Bituminous and anthracite	1975 p Total
U.S.S.R	157	511	668	161	523	684	166	535	701
United States	13	r 531	r 544	14	537	551	18	568	586
China, People's Republic of e	(1)	430	430	(1)	450	450	(1)	470	470
Germany, East	246	1	247	243	1	244	247	1	248
Germany, West	119	97	216	126	95	221	123	92	215
Poland	39	157	196	40	162	202	40	172	212
United Kingdom	--	r 130	r 130	--	109	109	--	129	129
Czechoslovakia	81	28	109	82	28	110	86	28	114
India	3	r 78	r 81	3	84	87	3	95	98
Australia	25	61	86	27	63	90	28	67	95
South Africa, Republic of	--	62	62	--	66	66	--	69	69
Korea, North	(1)	37	37	(1)	39	39	(1)	40	40
Yugoslavia	32	1	33	33	1	34	35	1	36
Romania	r 17	r 8	25	19	8	27	21	8	29
Bulgaria	26	(2)	26	24	(2)	24	27	(2)	27
France	3	26	29	3	23	26	3	22	25
Hungary	23	3	26	23	3	26	22	3	25
Canada	4	17	21	3	17	20	3	21	24
Total	r 788	r 2,178	r 2,966	801	2,209	3,010	822	2,321	3,143
All others	r 31	r 87	r 118	33	93	126	38	96	134
Grand total	819	r 2,265	r 3,084	834	2,302	3,136	860	2,417	3,277

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

Table 53.—Leading world producers of marketed natural gas

(Billion cubic feet)

Country	1973	1974	1975 p
United States	22,648	21,601	20,109
U.S.S.R.	r 8,346	9,201	10,206
Netherlands	2,495	2,957	3,208
Canada	3,119	3,046	3,076
China, People's Republic of e	950	1,200	1,400
United Kingdom	1,018	1,230	1,208
Romania	r 980	1,012	954
Iran	702	787	771
Germany, West	706	713	639
Mexico	542	561	584
Italy	541	540	514
Venezuela	460	476	450
Libya	385	345	383
Germany, East	248	273	280
Argentina	238	256	272
Total	r 43,378	44,198	44,054
All others	r 2,750	2,973	3,153
Grand total	r 46,128	47,171	47,207

e Estimate. p Preliminary. r Revised.

Table 54.—Leading world producers of natural gas liquids [1]

(Million 42-gallon barrels)

Country	1971	1972	1973	1974	1975 p
United States	618	638	634	616	595
Canada	87	110	118	114	112
U.S.S.R. e	62	67	79	83	90
Saudi Arabia	e 13	20	35	49	e 48
Mexico	21	24	27	28	33
Venezuela	26	31	34	31	29
Total	827	890	927	921	907
All others	68	94	116	113	117
Grand total	895	984	1,043	1,034	1,024

e Estimate. p Preliminary.
[1] Includes propane, butane, natural gasoline, and all other condensable products derived from the production of natural gas.

Table 55.—Leading world producers of crude oil

(Million 42-gallon barrels)

Country	1973	1974	1975 p
U.S.S.R	3,094	3,374	3,609
United States	3,361	3,203	3,052
Saudi Arabia	2,773	3,096	2,583
Iran	2,139	2,198	1,953
Venezuela	1,229	1,086	856
Iraq	737	721	826
Kuwait	1,102	930	762
Nigeria	750	823	652
United Arab Emirates	559	616	618
China, People's Republic of	365	474	572
Libya	794	555	551
Canada	648	617	521
Indonesia	489	502	477
Algeria	401	368	351
Mexico	191	238	294
Qatar	208	189	159
Australia	142	140	149
Argentina	154	151	144
Oman	107	106	124
Romania	107	108	109
Egypt	60	54	84
Gabon	55	74	82
Total	r 19,465	19,623	18,528
All others	r 903	915	970
Grand total	20,368	20,538	19,498

p Preliminary. r Revised.

Table 56.—Leading world producers of refined oil

(Million 42-gallon barrels)

Country	1971	1972	1973	1974	1975 p
United States [1]	4,644	4,909	5,144	5,019	5,091
U.S.S.R	2,336	2,520	2,728	2,814	2,925
Japan	1,370	1,498	1,742	1,701	1,616
France	802	889	1,002	950	809
Italy	892	926	975	905	740
Germany, West	801	811	859	850	726
United Kingdom	767	793	843	820	690
Canada	507	564	614	646	624
Netherlands	454	519	544	479	423
China, People's Republic of e	240	280	310	372	391
Brazil	194	239	286	296	330
Spain (including Canary Islands)	260	276	321	332	317
Venezuela	455	412	475	446	317
Iran	209	204	214	230	251
Mexico	184	197	211	236	248
Netherlands Antilles	285	281	317	282	221
Belgium	221	269	269	221	214
Australia	185	181	206	207	209
India	142	143	150	148	161
Argentina	175	169	172	170	158
Saudi Arabia [2]	217	225	225	234	158
Kuwait [2]	161	141	142	133	144
Total	15,501	16,446	17,749	17,491	16,763
All others	2,349	2,319	2,861	2,939	2.942
Grand total	17,850	18,765	20,610	20,430	19,705

e Estimate. p Preliminary.
[1] Including Puerto Rico and the Virgin Islands.
[2] Including the country's share of production from the Kuwait-Saudi Arabia Partitioned Zone.

Table 57.—Major world trade in

(Thousand

Source country	1974 production by source country [2]	1974 exports by source country [2]	Austria	Canada	France	West Germany
Bauxite:						
Australia	20,065	NA	--	--	368	2,361
Dominican Republic	1,210	1,210	--	--	--	--
France	2,938	114	--	--	XX	104
Ghana	363	398	--	--	--	99
Greece	3,004	1,457	--	--	130	105
Guinea	7,605	NA	--	988	408	469
Guyana	3,267	2,162	--	1,273	67	225
Haiti	649	[6] 793	--	--	--	48
Hungary	2,751	559	--	--	--	--
India	1,113	18	--	--	--	--
Indonesia	1,161	1,261	--	--	--	--
Jamaica	15,328	8,000	--	--	--	130
Malaysia	1,143	815	--	--	--	--
Sierra Leone	672	NA	--	352	--	323
Surinam	6,853	NA	--	355	17	35
United States	1,981	16	--	35	--	6
Yugoslavia	2,370	1,611	--	--	--	416
Other and not specified	6,615	NA	32	38	22	19
Total	79,088	NA	32	3,041	1,012	4,340
Alumina:						
Australia	4,896	[7] 4,706	--	385	--	139
Canada	1,209	30	--	XX	1	(5)
France	1,281	391	[8] (5)	(5)	XX	4
Germany, West	1,307	369	[8] 9	93	7	XX
Greece	494	NA	--	--	--	--
Guinea	e 665	e 610	--	--	--	42
Guyana	321	e 300	--	24	--	--
Hungary	e 693	626	[8] 96	--	--	--
Jamaica	2,871	2,816	--	166	--	24
Japan	1,801	79	--	--	--	--
Surinam	e 1,430	[9] 1,280	--	11	--	146
United States	6,885	670	--	204	2	3
Yugoslavia	e 300	8	--	--	--	1
Other and not specified	4,719	NA	[10] 93	1	4	142
Total	28,872	NA	198	884	14	501

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 official trade statistics of the listed countries. Data on alumina production are generally for output prior to calcination, while data on alumina exports, also from official trade statistics, include aluminum hydroxide and thus may not be exactly comparable.

bauxite and alumina in 1974[1]
metric tons)

Recipient country[3]									
Italy	Japan	Nether-lands	Norway	Spain	Sweden	United King-dom	United States[4]	U.S.S.R.	Selected others
1,439	3,155	--	--	1	48	(5)	--	--	188
--	--	--	--	--	--	--	1,304	--	--
--	--	--	--	1	--	--	--	--	11
--	--	--	--	20	--	223	--	--	--
--	9	137	5	42	34	55	--	503	16
251	--	--	--	--	--	--	1,276	253	--
16	55	4	1	57	9	--	616	--	21
--	--	--	--	--	--	--	595	--	--
--	--	--	--	--	--	--	--	--	--
--	8	--	--	--	--	--	--	--	--
--	1,293	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	7,891	--	--
--	780	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	3	--	--	9	--	4	2,856	--	--
--	--	--	--	--	--	--	XX	--	--
174	--	--	--	--	--	--	--	664	--
68	8	--	1	2	6	42	--	203	29
1,949	5,311	141	7	132	97	324	14,538	1,623	265
18	633	--	76	--	--	--	1,998	--	148
--	(5)	--	(5)	1	(5)	--	18	--	--
28	1	184	27	84	(5)	2	9	--	7
10	1	66	5	4	36	6	5	--	28
--	--	78	--	68	--	--	--	--	--
--	--	--	87	159	--	--	--	--	107
--	--	--	38	--	11	55	9	82	--
--	--	--	--	--	--	--	--	323	6
--	--	--	594	79	109	452	819	143	--
--	XX	--	--	(5)	--	--	(5)	--	--
--	--	201	289	--	23	--	429	--	--
4	7	1	168	(5)	6	6	XX	85	1
--	--	--	--	--	--	--	595	--	--
7	5	1	4	5	3	82	3	253	15
67	647	531	1,288	400	188	603	3,290	886	312

[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 are readily available. Data are official import statistics of recipient countries.
[4] Includes the Virgin Islands.
[5] Less than ½ unit.
[6] Data for year ending September 30, 1974.
[7] Australian Bureau of Statistics. Minerals and Mineral Products.
[8] Data represent export statistics of source country.
[9] World Mining. June 25, 1975.
[10] Figure represents difference between reported detail and reported total.

Table 58.—Major world trade in iron ores, concentrates, and agglomerates (excluding roasted pyrite)[1] in 1974

(Thousand metric tons)

Source country	Recorded total exports of source country[2]	Recorded imports of principal recipient country[3]: Canada	United States	Belgium-Luxembourg	Czechoslovakia[4]	France	West Germany	Hungary	Italy
Algeria	2,913	--	--	--	244	17	212	--	464
Angola	[5] 5,600	--	263	--	(4)	455	1,335	--	--
Australia	[6] 83,591	--	648	2,212	(4)	1,613	4,780	--	2,234
Brazil	59,439	536	6,677	1,643	474	4,090	11,980	7	3,267
Canada	37,448	XX	20,018	--	(4)	655	3,976	--	1,998
Chile	9,390	--	301	--	(4)	--	--	--	--
France	19,833	--	--	13,534	(4)	XX	3,675	--	--
India	35,549	--	--	--	624	--	563	101	--
Liberia	25,592	--	2,774	1,964	(4)	2,077	9,745	--	3,811
Malaysia	157	--	--	--	(4)	--	--	--	--
Mauritania	[6] 10,301	--	--	1,316	(4)	2,452	1,516	--	1,198
Norway[7]	2,810	--	--	--	(4)	55	1,462	--	--
Peru	e 6,800	--	1,839	--	(4)	354	1,167	--	104
Philippines	1,121	--	15	--	(4)	--	--	--	--
Sierra Leone	[5] 1,454	--	--	--	(4)	--	710	--	--
South Africa, Republic of	e 2,894	32	1	--	(4)	20	475	--	246
Spain	2,962	--	--	--	(4)	479	1,056	--	--
Swaziland	[6] 2,481	--	--	--	(4)	--	185	--	--
Sweden[7]	33,105	103	340	8,875	547	2,664	10,586	--	--
U.S.S.R	43,300	--	128	--	11,825	33	1,039	3,972	1,675
United States	2,360	1,663	XX	--	(4)	--	45	--	--
Venezuela	[6] 25,850	--	15,625	--	(4)	598	2,711	--	1,836
Other countries	[8] 4,013	--	123	--	(4)	122	502	--	275
Origin unreported	XX	--	48	3,885	271	138	--	25	947
Total	418,963	2,334	48,800	33,429	13,985	15,822	57,720	4,105	18,055

Source country	Recorded imports of principal recipient country[3]: Netherlands	Poland[4]	Romania[4]	United Kingdom[4]	Other Europe[9]	Japan	Other Asia and Pacific[10]	Other Western Hemisphere[11]	Recorded total imports
Algeria	--	(4)	(4)	(4)	83	--	--	--	1,020
Angola	--	(4)	(4)	123	97	2,799	--	--	5,072
Australia	--	(4)	(4)	792	1,736	67,881	768	(12)	82,664
Brazil	1,613	[13] 636	[13] 828	3,141	3,149	19,523	--	--	57,564
Canada	600	(4)	(4)	4,292	630	4,504	20	--	36,693
Chile	--	(4)	(4)	(4)	--	8,571	--	--	8,872
France	(12)	(4)	(4)	(4)	(12)	--	--	--	17,209

India	--	[13] 338	[13] 1,343	(4)	--	17,369	536	--	20,874
Liberia	1,595	(4)	(4)	701	861	1,315	--	--	24,843
Malaysia	--	(4)	(4)	(4)	--	84	29	--	113
Mauritania	305	(4)	(4)	1,533	708	2,187	--	--	11,215
Norway [7]	--	(4)	(4)	1,074	281	66	--	--	2,938
Peru	--	(4)	(4)	(4)	--	5,960	175	13	9,612
Philippines	--	(4)	(4)	(4)	--	1,636	8	--	1,659
Sierra Leone	318	(4)	(4)	(4)	--	1,018	--	--	2,046
South Africa, Republic of	--	(4)	(4)	58	3	2,313	(12)	--	3,148
Spain	302	(4)	(4)	227	36	--	--	--	2,100
Swaziland	--	(4)	(4)	(4)	--	1,925	--	--	2,110
Sweden [7]	1,855	[13] 2,462	(4)	3,925	1,686	--	--	--	33,043
U.S.S.R	--	[13] 11,389	[13] 5,699	1,091	5,384	987	--	--	43,222
United States	--	(4)	(4)	(4)	22	342	(12)	(12)	2,072
Venezuela	197	(4)	(4)	1,728	896	--	--	--	23,591
Other countries	276	(4)	(4)	(4)	119	3,471	40	24	[14] 4,952
Origin unreported	--	784	2,132	990	1,620	--	1	1,200	12,041
Total	7,061	[15] 15,609	10,002	19,675	17,311	141,951	1,577	1,237	408,673

[e] Estimate. XX Not applicable.

[1] Disparities between recorded total exports of source countries and recorded total 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 9, 10, and 11.

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

[3] Unless otherwise specified, data are compiled from official import statistics of listed recipient 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] Exports not available. Production reported in lieu of exports as all or nearly all output is exported.

[6] Official mineral statistics publication of source country rather than official trade returns.

[7] In previous editions of this table, import figures for various recipient countries were adjusted to account for Swedish ores shipped through Narvik, Norway, and erroneously credited to Norway by such recipient countries. No such adjustment is necessary for 1974.

[8] Summation of (1) recorded exports of the following countries, with export quantity following country name in thousand metric tons: Austria—1; Belgium-Luxembourg—69; Denmark—6; West Germany—5; Hong Kong—160; Italy—18; Republic of Korea—76; Morocco—10; Netherlands—196; New Zealand—2,235; and Tunisia—526; 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: Indonesia—372 (Japanese imports only); North Korea—305 (Japanese imports only); Panama—24 (Mexican imports only); and Poland—10 (West German imports only). In addition to the foregoing list of countries, Mexico, Monaco, Switzerland, the United Kingdom, and Yugoslavia recorded iron ore exports, but each of these nations individually exported less than 500 tons.

[9] Includes the following countries with recorded total imports of each following the country name in thousand metric tons: Austria—2,800; Bulgaria—2,396; Denmark—less than ½ unit; Finland—1,133; East Germany—2,807; Greece—1,025; Norway—1,308; Portugal—10; Spain—5,280; Sweden—82; Switzerland—39; and Yugoslavia—431.

[10] Includes the following countries with recorded total imports of each following the country name in thousand metric tons: Australia—28; Republic of Korea—1,395; Malaysia—less than ½ unit; Singapore—10; and Taiwan—144.

[11] Includes the following countries with recorded total imports of each following the country name in thousand metric tons: Argentina—1,200; Brazil—less than ½ unit; Mexico—37; and Venezuela—less than ½ unit.

[12] Less than ½ unit.

[13] Official export statistics of source country.

[14] Includes the following reported source countries with total quantity credited to each following the country name in thousand metric tons: Belgium-Luxembourg—47; Czechoslovakia—74; Denmark—4; Finland—8; Gabon—58; West Germany—16; Greenland—10; Hong Kong—180; Indonesia—372; Iran—1; Italy—14; Japan—40; Papua New Guinea—49; North Korea—305; Republic of Korea—83; Morocco—362; Mozambique—141; Netherlands—2; New Zealand—2,409; Nigeria—2; Panama—300; People's Republic of China—less than ½ unit; Poland—1; Portugal—337; Thailand—23; Tunisia—113; and United Kingdom—less than ½ unit.

[15] Quarterly Bulletin of Steel Statistics for Europe. No. 1, 1975.

Table 59.—Major world trade in unrefined and refined unwrought copper in 1974 [1]

(Thousand metric tons)

Source	Destination: Belgium-Luxembourg	Brazil	People's Republic of China	Czechoslovakia	France	West Germany	Italy	Japan
Belgium-Luxembourg	XX	--	--	--	112	61	--	--
Canada	6	3	9	--	14	27	6	3
Chile	8	11	--	--	19	94	52	129
Germany, West	22	9	(2)	--	16	XX	4	--
Peru [3]	13	--	34	--	(2)	12	--	7
U.S.S.R	4	(2)	--	39	17	12	2	16
United Kingdom	1	1	5	--	5	14	19	2
United States	3	22	--	--	17	11	24	4
Yugoslavia	--	--	15	--	3	2	6	--
Zaire [3]	239	--	--	--	47	22	74	16
Zambia	12	27	18	--	64	92	78	137
Other [4]	17	2	34	--	15	43	10	(2)
Total	325	75	115	39	329	390	275	314

Source	Netherlands	Spain	Sweden	Switzerland	United Kingdom	United States	Other and unspecified	Total
Belgium-Luxembourg	21	--	--	--	27	--	68	289
Canada	2	2	7	3	92	105	5	284
Chile	--	8	16	--	69	51	[5] 146	603
Germany, West	6	8	1	8	38	5	23	140
Peru [3]	3	--	--	--	3	86	15	173
U.S.S.R	38	(2)	10	--	10	--	[6] 100	248
United Kingdom	3	4	3	(2)	XX	3	11	71
United States	4	(2)	1	(2)	14	XX	17	117
Yugoslavia	--	--	--	(2)	2	43	1	72
Zaire [3]	14	--	--	--	12	--	27	451
Zambia	5	8	8	11	153	3	[7] 56	672
Other [4]	109	1	5	4	13	84	60	397
Total	205	31	51	26	433	380	529	3,517

XX Not applicable.
[1] Unless otherwise specified, data are compiled from export statistics for countries listed as sources.
[2] Less than ½ unit.
[3] World Bureau of Metal Statistics. World Metal Statistics. V. 30, No. 3, 1977.
[4] Includes the following countries (total exports in thousand tons in parentheses following names): Australia (NA); Austria (11); Denmark (2); Finland (12); France (14); Italy (10); Japan (280); the Netherlands (23); New Zealand (less than ½ unit); Norway (34); Spain (7); and Switzerland (5).
[5] Includes 25,942 tons to Argentina.
[6] Includes 33,128 tons to Hungary and 9,289 tons to Romania.
[7] Includes 20,514 tons to India.

Table 60.—Major world trade in lead 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
1974									
United States	r 14.5	r 53.5	--	--	--	--	17.5	--	r 85.5
Western Europe:									
Belgium-Luxembourg [5]	NA	22.0	30.1	7.1	14.5	NA	NA	14.3	88.0
France	29.0	4.7	51.4	--	30.4	--	--	.6	116.1
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	r 67.4	r 44.2	r 129.0	r 10.6	r 60.9	1.4	14.3	r 22.8	r 350.6
Japan	96.3	27.2	--	--	--	10.4	6.7	.1	140.7
Grand total	r 178.2	r 124.9	r 129.0	r 10.6	r 60.9	11.8	38.5	r 22.9	r 576.8
1975									
United States	26.3	32.8	5.9	--	--	--	14.4	--	79.4
Western Europe:									
Belgium-Luxembourg [5] [6]	12.1	19.5	12.7	NA	6.8	NA	NA	18.2	69.3
France [7]	13.9	1.0	20.6	--	6.7	--	--	--	42.2
Germany, West	44.4	8.2	44.5	3.2	17.3	.9	.3	--	118.8
United Kingdom	14.9	4.9	1.0	--	1.4	--	4.2	3.1	29.5
Total	85.3	33.6	78.8	3.2	32.2	.9	4.5	21.3	259.8
Japan	74.1	26.0	--	--	--	12.2	6.2	--	118.5
Grand total	185.7	92.4	84.7	3.2	32.2	13.1	25.1	21.3	457.70

r Revised. NA Not available.
[1] Imports by countries other than those listed are believed to be generally smaller than those by 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.
[6] January through October only.
[7] January through June only.

Source: Monthly Bulletin of the International Lead and Zinc Study Group. Lead and Zinc Statistics. V. 16, No. 4, 1976, p. 24.

Table 61.—Major world trade in steel ingots

(Thousand

Exporting area and country	North America: Canada	North America: United States	Latin America [2]	Europe: EEC	Europe: EFTA	Europe: Other market economy countries
North America:						
Canada [6]	XX	1,348.8	146.5	107.0	1.3	10.9
United States	1,414.9	XX	2,105.6	393.3	117.6	104.3
Total	1,414.9	1,348.8	2,252.1	500.3	118.9	115.2
Europe:						
Market economy countries:						
EEC:						
Belgium-Luxembourg	152.0	1,305.0	757.0	10,711.0	900.0	263.0
Denmark	(7)	1.5	4.0	101.0	179.9	14.1
France	126.6	1,138.5	299.4	4,630.4	914.7	450.6
Germany, West [8]	247.0	2,003.1	1,280.2	8,782.0	2,230.2	1,077.5
Italy	5.1	301.0	326.4	1,011.4	232.1	272.0
Netherlands [9]	4.6	529.2	72.6	2,721.5	517.7	109.1
United Kingdom	177.1	546.9	221.3	827.9	346.0	300.3
Subtotal	712.4	5,825.2	2,960.9	28,785.2	5,320.6	2,486.6
EFTA:						
Austria	6.0	23.2	16.5	898.0	236.5	102.8
Norway	.3	10.1	12.4	343.3	146.8	62.5
Portugal	.4	.5	3.7	2.2	.5	.2
Sweden	24.1	112.8	61.6	1,082.1	260.6	215.5
Switzerland	2.2	2.1	1.9	86.1	63.0	10.5
Subtotal	33.0	148.7	96.1	2,411.7	707.4	391.5
Other:						
Finland	.2	7.6	(7)	143.4	244.2	--
Greece [6]	--	49.6	12.0	34.7	.1	230.7
Spain	2.1	64.6	58.0	309.4	29.4	15.7
Yugoslavia	--	27.5	9.1	89.4	17.0	16.8
Subtotal	2.3	149.3	79.1	576.9	290.7	263.2
Centrally planned economy countries:						
Bulgaria	--	--	40.9	224.7	25.3	109.4
Czechoslovakia	89.2	24.8	14.2	536.3	150.7	422.5
Germany, East [10]	--	1.0	--	120.3	22.8	77.6
Hungary	(7)	(7)	8.0	148.0	129.0	226.0
Poland	17.0	156.0	30.7	162.5	121.4	130.6
Romania [10]	3.8	5.0	--	190.4	19.9	57.3
U.S.S.R	--	--	232.0	12.3	6.8	387.6
Subtotal	110.0	186.8	325.8	1,394.5	475.9	1,411.0
Total	857.7	6,310.0	3,461.9	33,168.3	6,794.6	4,552.3
Africa: South Africa, Republic of [6]	8.0	23.2	38.0	74.2	.4	2.2
South Asia and Far East:						
India [11]	.6	12.1	(7)	13.7	.3	.5
Japan	918.8	5,790.6	4,360.9	1,053.7	661.7	811.0
Total	919.4	5,802.7	4,360.9	1,067.4	662.0	811.5
Oceania: Australia [6 12]	2.3	21.4	53.5	250.9	.2	.1
Grand total	3,202.3	13,506.1	10,166.4	35,061.1	7,576.1	5,481.3

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

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

and semimanufactures in 1974, by area
metric tons)

Destination [1]								
			South Asia and Far East					
Centrally planned economy countries [3]	Africa	Near East [4]	Japan	Other market economy countries	Centrally planned economy countries [5]	Oceania	Unallocated	Total
15.8	44.7	51.6	0.2	34.9	0.5	14.8	0.7	1,777.7
49.3	255.6	264.6	10.9	563.7	1.1	62.6	--	5,343.5
65.1	300.3	316.2	11.1	598.6	1.6	77.4	.7	7,121.2
1,356.0	515.0	521.0	1.0	96.0	16.0	15.0	--	16,608.0
1.7	3.2	4.7	(7)	3.2	(7)	(7)	.2	313.5
562.5	838.5	581.7	.7	104.7	13.6	29.8	.1	9,691.8
3,447.7	958.4	1,301.4	4.1	483.4	471.2	38.2	--	22,324.4
966.6	799.5	753.8	.1	52.7	13.5	5.7	9.8	4,749.7
94.3	102.2	150.5	.4	30.2	1.3	1.3	18.9	4,353.8
117.5	210.9	226.3	4.1	255.6	21.9	93.9	--	3,349.7
6,546.3	3,427.7	3,539.4	10.4	1,025.8	537.5	183.9	29.0	61,390.9
338.3	9.4	73.4	.6	6.1	3.2	3.7	5.1	1,722.8
2.4	3.8	3.2	.1	2.4	--	(7)	--	587.3
--	9.9	.7	--	2.0	--	.5	.2	20.8
168.8	44.3	11.2	4.4	19.9	12.4	12.1	--	2,029.8
10.3	5.3	26.9	(7)	.5	(7)	(7)	--	208.8
519.8	72.7	115.4	5.1	30.9	15.6	16.3	5.3	4,569.5
23.6	(7)	26.2	(7)	2.0	.1	--	.1	447.4
13.6	46.4	53.0	--	--	--	--	.2	440.3
167.4	43.3	78.5	(7)	--	25.3	.1	6.0	799.8
371.5	4.6	96.0	--	6.0	13.9	--	.1	651.9
576.1	94.3	253.7	(7)	8.0	39.3	.1	6.4	2,339.4
237.6	9.0	130.1	--	28.0	5.6	--	--	810.6
1,401.7	22.5	302.9	--	22.1	57.3	--	--	3,044.2
--	--	--	--	--	--	--	3,868.3	4,090.0
218.0	15.0	101.0	--	41.0	11.0	--	--	897.0
743.2	7.4	33.7	.8	25.2	40.9	--	.2	1,469.6
--	--	4.7	--	--	--	--	1,229.9	1,511.0
5,249.6	53.5	273.1	--	110.3	93.4	--	470.4	6,889.0
7,850.1	107.4	845.5	.8	226.6	208.2	--	5,568.8	18,711.4
15,492.3	3,702.1	4,754.0	16.3	1,291.3	800.6	200.3	5,609.5	87,011.2
--	--	82.2	(7)	14.6	--	2.2	366.6	611.6
5.5	10.1	83.1	(7)	47.7	--	3.0	.1	176.7
1,589.6	1,354.7	3,541.5	XX	7,824.7	3,044.1	1,251.0	17.6	32,219.9
1,595.1	1,364.8	3,624.6	(7)	7,872.4	3,044.1	1,254.0	17.7	32,396.6
20.0	10.8	19.8	247.4	358.0	24.7	229.1	--	1,238.2
17,172.5	5,378.0	8,796.8	274.8	10,134.9	3,871.0	1,763.0	5,994.5	128,378.8

[6] Data exclude exports of wheels, tires, and axles.
[7] Less than ½ unit.
[8] Excludes exports to East Germany.
[9] Excludes exports to Belgium-Luxembourg.
[10] The distribution is composed of partial figures derived from import data of major trading partner countries as reported by United Nations, 1974 World Trade Annual, v. 3, Walker and Co., New York, 1975. The total is taken from United Nations, Quarterly Bulletin of Steel Statistics for Europe, v. 26, No. 4, 1976.
[11] Data are for year ending Mar. 31, 1974.
[12] Data are for year ending June 30, 1974.

Table 62.—World trade in

(Gross weight,

Destination	Angola	Australia	Brazil	People's Republic of China	Gabon	Ghana	India
Argentina [3]	NA	NA	58,929	NA	NA	NA	NA
Belgium-Luxembourg	53,983	--	--	--	--	--	--
Brazil	--	--	--	--	7,594	--	--
Bulgaria [3]	NA	NA	NA	NA	NA	NA	26,146
Canada	--	--	31,086	--	36,611	--	--
Czechoslovakia [3]	NA	NA	37,998	NA	NA	NA	32,131
France	--	53,567	4,712	--	719,497	12,720	--
Germany, East [3]	NA	NA	NA	NA	NA	NA	NA
Germany, West	2,160	204,610	142,162	870	[4] 25,100	--	--
Italy	--	--	17,983	908	153,187	--	--
Japan	300	652,488	42,667	56,728	[4] 137,343	54,176	844,891
Korea, North [3]	NA	NA	NA	NA	NA	NA	9,400
Korea, Republic of	--	22,029	--	--	--	--	13,552
Netherlands	NA	NA	([5])	NA	NA	NA	NA
Norway	28,537	70,509	207,127	--	[4] 292,901	89,179	--
Poland	NA	NA	NA	NA	NA	NA	NA
Singapore	--	--	--	--	--	4,928	--
Spain	--	26,438	61,060	536	64,981	39,846	--
Sweden	--	--	--	--	958	--	20
Taiwan	--	6,753	--	--	--	--	7,878
United Kingdom	--	--	108,849	--	[4] 69,452	43,988	--
United States	--	211,786	420,719	--	274,451	8,936	--
Yugoslavia	--	--	--	--	18,000	--	--
Other [6]	--	9,391	17,064	2,611	[4] 3,346	2,371	--
Total recorded imports [7]	84,980	1,257,571	1,150,356	61,653	1,803,421	256,144	934,018
Total recorded exports [8]	NA	NA	1,493,170	NA	[9] 2,103,634	NA	1,034,603

NA Not available. XX Not applicable.

[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 10 (with total quantities credited to each in parentheses, following the country name, in metric tons): Austria (20), Belgium-Luxembourg (19,565), Botswana (14,352), Bulgaria (249), Fiji (645), France (6,179), West Germany (2,232), Greece (4,264), Hong Kong (20), Hungary (3,176), Indonesia (14,717), Israel (20), Japan (2,549), Malagasy Republic (1), Netherlands (6,816), New Hebrides (37,882), Philippines (1,607), Poland (20), Portugal (6,183), Romania (44,372), Singapose (1,747), Spain (505), Sweden (24,422), Taiwan (5), Thailand (13,885), Turkey (3,060), United Kingdom (1,313), United States (36,345), and Yugoslavia (3,818).

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

[4] Includes material reported as originating in Congo (Brazzaville), but believed to have originated in Gabon, as follows, in metric tons: West Germany—25,100; Japan—20,369; Norway—65,530; United Kingdom—14,215; and India (included in other)—2,776.

[5] Import statistics of the Netherlands include a substantial quantity of material originating from

manganese ore in 1974[1]

metric tons)

Source								
Malaysia	Mexico	Morocco	Republic of South Africa	U.S.S.R.	Zaire	Other[2]	Unspecified	Total
NA	NA	NA	NA	NA	NA	NA	NA	58,929
--	--	--	210,159	--	59,143	150	82,715	406,150
--	500	--	--	--	--	3,459	--	11,553
NA	NA	NA	NA	130,000	NA	NA	NA	156,146
--	221	--	11,974	3,200	9,473	32,538	--	125,103
NA	NA	3,063	NA	329,000	NA	NA	NA	402,192
--	25,600	34,475	569,294	1,100	--	6,233	1,246	1,428,444
NA	NA	3,000	NA	150,000	NA	NA	NA	153,000
--	--	9,926	422,905	10,539	4,014	5,934	177	828,397
--	--	8,020	118,361	--	150	9,463	--	308,072
86,477	93,727	651	1,684,670	143,478	11,698	98,379	--	3,907,673
NA	NA	NA	NA	21,000	NA	NA	NA	30,400
16,755	--	--	--	--	--	2,122	--	54,458
NA	NA	(5)	NA	NA	NA	836	[5] 68,919	69,755
--	--	--	238,068	73,569	29,154	--	4,003	1,033,047
NA	NA	[3] 1,837	NA	[3] 495,000	NA	NA	[3] 59,163	556,000
--	2	--	--	--	--	2	--	4,932
--	--	10,600	155,677	--	15,046	9,911	8	384,103
--	--	--	--	34,797	--	2,093	2	37,870
--	--	--	50	--	--	14,204	--	28,885
--	--	8,860	134,179	--	--	9,795	13,331	388,454
--	35,399	46,457	66,771	--	46,813	--	--	1,111,332
--	--	--	--	29,118	12,446	14,612	--	74,176
--	--	280	89	14,622	--	64,620	535	114,929
103,232	155,449	127,169	3,612,197	1,435,423	187,937	274,351	230,099	11,674,000
107,664	264,695	164,940	NA	1,500,000	NA	[10] 495,502	XX	XX

unreported sources; the bulk of this material is believed to have originated from Brazil and Morocco on the basis of export statistics of those nations.

[6] Includes the following countries reporting imports (with total imports in parentheses, following the country name, in metric tons): Australia (1,906), Austria (898), Denmark (2,768), Finland (29,652), Greece (22,709), Hong Kong (680), Hungary (14,614), India (2,776), Iran (615, for year beginning March 21, 1974), Ireland (35), Kenya (535), Malaysia (1,179), Mexico (24,382), Morocco (177), Philippines (2,433), Portugal (508), Thailand (8,292), and Venezuela (145).

[7] Sum of figures listed for individual destinations, including those items covered by footnote 3.

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

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

[10] Includes the following countries (quantities in parentheses, following country name, in metric tons): Belgium-Luxembourg (202,382), Denmark (139), France (2,211), West Germany (1,294), Greece (7,624), Hungary (15,173), Italy (82), Japan (4,887), Netherlands (33,553), Norway (1,831), Philippines (2,127), Portugal (3,680), Romania (54,800), Spain (144), Sweden (849), Thailand (18,780), United Kingdom (138,302), and United States (202,382).

Table 63.—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]
1974									
United States	36.4	62.1	r 3.2	--	--	2.4	3.0	0.3	r 107.4
Western Europe:									
France [6]	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 [7]	.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	r 1.3	--	r 81.2	--	r 3.9	--	--	--	r 23.4
Total	r 41.2	16.1	r 144.0	1.3	r 10.1	16.0	195.4	9.9	r 434.0
Japan	r 8.8	4.4	--	--	3.7	4.3	7.4	--	r 28.6
Grand total	r 86.4	82.6	r 147.2	1.3	r 13.8	22.7	205.8	10.2	r 570.0
1975									
United States	27.4	45.2	16.8	--	1.0	.1	--	.6	91.1
Western Europe:									
France [6]	--	--	27.6	.6	.7	--	--	.3	29.2
Germany, West	2.3	--	64.7	.4	.5	32.3	16.5	--	116.7
Netherlands	--	2.2	24.2	.2	--	3.0	11.7	.2	41.5
Switzerland	3.8	1.0	8.3	--	--	.9	.6	--	14.6
United Kingdom	41.3	--	--	--	--	.1	153.7	4.1	199.2
Other	1.3	--	15.3	--	2.9	--	--	--	19.5
Total	48.7	3.2	140.1	1.2	4.1	36.3	182.5	4.6	420.7
Japan	2.3	5.6	--	--	1.8	9.2	1.5	--	20.4
Grand total	78.4	54.0	156.9	1.2	6.9	45.6	184.0	5.2	532.2

r Revised.

[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 Eastern 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 September for 1974 and January through June for 1975.

[7] January through October.

Source: Monthly Bulletin of the International Lead and Zinc Study Group. Lead and Zinc Statistics. V. 15, No. 5, May 1975, p. 24; and V. 16, No. 5, May 1976, p. 24.

Table 64.—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
1974									
United States	147.4	49.8	3.4	--	--	12.1	5.1	--	217.8
Western Europe:									
Belgium-Luxembourg [5 6]	279.4	NA	100.0	NA	NA	NA	34.6	r 124.9	r 538.9
France [6]	57.0	55.0	81.0	--	r 24.6	9.7	(7)	1.8	r 229.1
Germany, West	163.5	33.9	r 79.7	r .8	r 25.9	4.4	r 4.4	--	r 312.6
United Kingdom	r 13.7	r 38.4	9.3	--	4.0	4.6	35.8	3.9	109.7
Other [8]	22.1	11.5	80.8	--	1.9	--	64.4	--	180.7
Total	r 535.7	r 138.8	r 350.8	r .8	r 56.4	18.7	139.2	r 130.6	r 1,371.0
Japan	r 245.7	r 190.5	--	--	5.6	57.0	101.9	2.0	602.7
Grand total	r 928.8	r 379.1	r 354.2	r .8	r 62.0	87.8	246.2	r 132.6	r 2,191.5
1975									
United States	89.5	32.7	.3	--	--	5.3	3.7	--	131.5
Western Europe:									
Belgium-Luxembourg [5 9]	358.5	NA	36.8	NA	NA	NA	NA	134.4	529.7
France [10]	16.8	34.9	30.5	--	9.7	3.0	0.9	--	95.8
Germany, West	109.6	34.0	74.6	.6	34.6	7.2	2.5	--	263.1
United Kingdom	2.6	20.9	4.4	--	.9	--	12.5	3.7	45.0
Other [8 11]	64.1	11.1	67.2	--	--	--	61.6	--	204.0
Total	551.6	100.9	213.5	.6	45.2	10.2	77.5	138.1	1,137.6
Japan	148.6	166.4	--	--	--	54.0	76.8	.8	446.6
Grand total	789.7	300.0	213.8	.6	45.2	69.5	158.0	138.9	1,715.7

r Revised. NA Not available.
[1] Imports by countries other than those listed as destinations are believed to be generally smaller than those by listed countries.
[2] Includes Mexico.
[3] Includes Yugoslavia.
[4] Includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Romania, and the U.S.S.R.
[5] Gross weight of ore.
[6] January through September only.
[7] Revised to none.
[8] Consists of the Netherlands and Norway. Norway data are gross weight of ore.
[9] January through October only.
[10] January through June only.
[11] Data for the Netherlands are January through October only.

Source: Monthly Bulletin of the International Lead and Zinc Study Group. Lead and Zinc Statistics. V. 15, No. 4, April 1975, p. 25; and V. 16, No. 4, April 1976, p. 25.

Table 65.—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]
1974									
United States	245.1	49.5	81.1	8.6	20.5	47.8	35.3	1.7	489.6
Western Europe:									
Denmark	(5)	r .1	11.3	.1	1.3	.3	--	--	r 13.1
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	--	r 17.4
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	r 34.6	r 7.1	326.1	25.2	6.8	10.9	14.5	8.2	r 433.4
Japan	5.0	--	.6	6.0	--	11.7	.5	--	23.8
Grand total	r 284.7	r 56.6	407.8	39.8	27.3	70.4	50.3	9.9	r 946.8
1975									
United States	164.8	33.3	105.0	.4	14.0	6.5	20.8	.3	345.1
Western Europe:									
Denmark	--	--	11.0	--	--	--	--	--	11.0
France[6]	.6	2.5	17.0	2.7	.2	5.5	--	.2	28.7
Germany, West	2.3	2.3	65.3	2.4	1.2	5.3	--	--	78.8
Netherlands	--	.6	20.1	.8	2.4	1.2	--	--	25.1
Sweden	--	1.1	36.1	4.6	.5	.4	--	--	42.7
Switzerland	.7	.1	12.9	.5	1.2	1.3	--	--	16.7
United Kingdom	60.2	.5	96.1	7.8	3.5	1.1	17.2	5.9	192.3
Total	63.8	7.1	258.5	18.8	9.0	14.8	17.2	6.1	395.3
Japan	2.9	2.4	--	1.6	--	19.1	.3	--	26.3
Grand total	231.5	42.8	363.5	20.8	23.0	40.4	38.3	6.4	766.7

r Revised.
1 Includes Mexico.
2 Includes Yugoslavia.
3 Includes Bulgaria, East Germany, Poland, the U.S.S.R., and unspecified other countries.
4 Reported totals.
5 Revised to none.
6 January through June only.

Table 66.—World movement of solid fuels in 1973 and 1974 [1]

(Thousand metric tons of standard coal equivalent)

Source	Destination										
	Market economy countries								Centrally planned economy countries of Europe [7]	Unspecified [8]	World [9]
	North America [2]	Carbibean America [3]	Other America [4]	Western Europe [5]	Africa	Near East	Far East	Oceania [6]			
1973											
Market economy countries:											
North America [2]	r 16,215	r 415	r 2,550	13,315	--	--	28,240	40	280	r 15	r 61,075
Western Europe [5]	850	155	100	r 30,875	295	--	([10])	--	755	r 605	r 33,745
Africa	--	--	--	r 1,130	r 570	--	r 250	r 10	--	r 105	r 2,065
Far East	--	r 145	r 170	--	--	--	r 870	r 35	--	r 40	r 1,260
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]	r 17,105	r 830	r 3,150	r 77,865	r 1,565	--	59,815	r 115	r 42,425	r 1,485	r 204,545
1974											
Market economy countries:											
North America [2]	13,995	535	2,190	15,195	10	--	35,060	25	150	5	67,180
Western Europe [5]	2,635	--	35	33,885	160	--	--	--	775	450	38,060
Africa	5	--	--	935	540	--	245	--	--	115	1,840
Far East	--	130	225	--	--	--	790	5	--	--	1,150
Oceania [6]	--	--	40	4,750	--	--	24,300	40	50	110	29,570
Centrally planned economy countries [7]	440	120	745	35,690	890	--	5,710	--	40,930	430	84,960
Total [9]	17,075	785	3,235	90,455	1,600	--	66,105	70	41,905	1,110	222,780

r Revised.
[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.
[10] Revised to none.

Source: United Nations. World Energy Supplies 1950–74. Statistical Papers, ser. J, No. 19, New York, 1976, pp. 162–165.

Table 67.—World movement of natural gas in 1973 and 1974, by country[1]

(Billion cubic feet)

Importing country	Exporting country: Afghanistan	Algeria	Canada	Iran	Libya	Netherlands	U.S.S.R.	United States	Others[2]	Total
1973										
Argentina	--	--	--	--	--	--	--	--	55	55
Austria	--	--	--	--	--	--	57	--	1	58
Belgium-Luxembourg	--	--	--	--	--	343	--	--	1	344
Canada	--	--	XX	--	--	--	--	15	--	15
Czechoslovakia	--	--	--	--	--	--	83	--	--	83
France	--	[3,4] 56	--	--	--	292	--	--	--	[5] 348
Germany, East	--	--	--	--	--	--	29	--	--	29
Germany, West	--	--	--	--	--	659	12	--	--	671
Hungary	--	--	--	--	--	--	--	--	7	7
Italy	--	--	--	--	[3,4] 76	--	--	--	--	[4] 76
Japan	--	--	--	--	--	--	--	[4] 48	[3,4] 54	[4] 102
Malaysia (Sarawak)	--	--	--	--	--	--	--	--	5	5
Mexico	--	--	--	--	--	--	--	14	--	14
Poland	--	--	--	--	--	--	60	--	--	60
Spain	--	--	--	--	[3,4] 36	--	--	--	--	[4] 63
Switzerland	--	--	--	--	--	--	--	--	7	7
U.S.S.R	97	--	--	307	--	--	XX	--	--	404
United Kingdom	--	[3,4] 31	--	--	--	--	--	--	--	31
United States[5]	--	3	1,028	--	--	--	--	XX	2	1,033
Total	97	[3,4] 90	1,028	307	[3,4] 139	1,294	241	[5] 77	[5] 132	[5] 3,405
1974										
Argentina	--	--	--	--	--	--	--	--	55	55
Austria	--	--	--	--	--	--	74	--	3	77
Belgium-Luxembourg	--	--	--	--	--	410	--	--	1	411
Bulgaria	--	--	--	--	--	--	11	--	--	11
Canada	--	--	XX	--	--	--	--	13	--	13
Czechoslovakia	--	--	--	--	--	--	114	--	--	114
Finland	--	--	--	--	--	--	16	--	--	16
France	--	[3,4] 65	--	--	--	345	--	--	--	[5] 410
Germany, East	--	--	--	--	--	--	102	--	--	102
Germany, West	--	--	--	--	--	868	76	--	--	944
Hungary	--	--	--	--	--	--	--	--	7	7
Italy	--	--	--	--	[3,4] 72	68	28	--	--	[5] 168
Japan	--	--	--	--	--	--	--	[4] 50	[3,4] 131	[4] 181
Malaysia (Sarawak)	--	--	--	--	--	--	--	--	[e] 5	[e] 5
Mexico	--	--	--	--	--	--	--	14	--	14
Poland	--	--	--	--	--	--	75	--	--	75
Spain	--	--	--	--	55	--	--	--	--	[4] 55
Switzerland	--	--	--	--	--	--	--	--	47	47
U.S.S.R	101	--	--	321	--	--	XX	--	--	422
United Kingdom	--	[3,4] 25	--	--	--	--	--	--	--	25
United States[6]	--	--	959	--	--	--	--	XX	(7)	959
Total	101	[3,4] 90	959	321	[3,4] 127	1,691	496	[5] 77	[5] 249	[5] 4,111

[e] Estimate. XX Not applicable.

[1] Compiled from official export statistics of source country unless otherwise specified.

[2] Includes the following countries with quantities in billion cubic feet and destinations as noted: 1973: Bolivia—55, all to Argentina; Brunei—59, including 54 to Japan and 5 to Malaysia (Sarawak); France—4, including 1 to Belgium-Luxembourg and 3 to Switzerland; West Germany—5, including 1 to Austria and 4 to Switzerland; Mexico—2, all to the United States; and Romania—7, all to Hungary; 1974: Bolivia—55, all to Argentina; Brunei—136, including 131 to Japan and 5 (estimated) to Malaysia (Sarawak); France—4, including 1 to Belgium-Luxembourg and 3 to Switzerland; West Germany—47, including 3 to Austria and 44 to Switzerland; Mexico—less than ½ unit, all to the United States; and Romania—7, all to Hungary.

[3] Data from import statistics of recipient country.

[4] Liquefied natural gas.

[5] Includes, in part, liquefied natural gas as indicated by footnotes in detail.

[6] Data from the U.S. Federal Power Commission, rather than official foreign trade statistics.

[7] Less than ½ unit.

Table 68.—World movement of crude petroleum in 1973 and 1974 [1]

(Thousand metric tons)

Source [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
1973										
Market economy countries:										
North America	r 51,230	--	--	40	--	--	30	--	--	r 51,300
Caribbean America	r 44,360	r 58,030	4,140	r 13,360	--	--	460	--	--	r 120,350
Other America	2,870	5,800	2,670	900	--	--	--	--	--	r 12,240
Western Europe	--	--	--	r 4,870	--	--	--	--	--	r 4,870
Africa	r 48,810	23,710	2,940	r 180,010	r 4,870	100	7,110	--	r 6,040	r 273,590
Near East	49,120	39,870	r 32,370	r 483,900	25,760	r 27,810	271,470	13,070	16,370	r 959,740
Far East	10,080	r 1,670	--	490	--	--	r 51,830	80	--	r 64,150
Oceania	--	--	--	10	--	r 220	(3)	(3)	r 50	280
Centrally planned economy countries of Europe	--	5,290	--	r 26,000	1,610	150	r 2,460	--	52,020	r 87,530
Total	206,470	r 134,370	r 42,120	r 709,580	r 32,240	r 28,280	r 333,360	r 13,150	r 74,480	r 1,574,050
1974										
Market economy countries:										
North America	40,350	130	--	--	--	--	--	--	--	40,480
Caribbean America	39,600	46,080	3,560	10,520	--	--	400	--	--	100,160
Other America	2,730	5,010	2,690	1,190	--	--	--	--	--	11,620
Western Europe	40	--	--	3,260	20	--	--	--	--	3,320
Africa	51,230	19,330	4,770	156,480	5,920	330	8,650	--	1,480	248,190
Near East	67,530	42,870	31,890	499,520	26,630	28,440	266,590	12,760	10,970	987,200
Far East	13,990	4,790	--	--	--	--	43,680	750	--	63,210
Oceania	--	--	--	--	--	170	--	--	10	180
Centrally planned economy countries of Europe	--	5,350	190	18,060	1,030	--	5,050	--	55,530	85,210
Total	215,470	123,560	43,100	689,030	33,600	28,940	324,370	13,510	67,990	1,539,570

r Revised.
[1] Data are based on general trade system.
[2] For details on countries included in each area, see footnotes to table 66.
[3] Revised to none.

Source: United Nations. World Energy Supplies 1950–74. Statistical Papers, ser. J, No. 19, New York, 1976, pp. 228–237.

Table 69.—Refined petroleum fuel trade in 1973 and 1974, by continental area [1]

(Million metric tons)

Continental area [2]	Exports		Imports		Bunkers	
	1973	1974	1973	1974	1973	1974
Market economy countries:						
North America	13.65	11.51	148.09	125.43	19.93	19.61
Caribbean America	137.73	135.29	18.83	17.94	17.25	16.56
Other America	.88	.71	3.69	3.27	1.91	2.01
Western Europe	117.55	99.07	131.45	119.37	52.17	45.02
Africa	6.20	5.96	10.51	10.67	7.44	7.04
Near East	56.75	53.51	3.47	4.49	23.55	23.86
Far East	28.76	26.04	45.66	42.22	34.75	37.85
Oceania	2.89	2.50	6.91	7.46	5.36	5.15
Centrally planned economy countries:						
Asia	.18	.22	1.44	1.81	NA	NA
Europe	38.23	41.33	6.19	5.69	3.55	3.55
Total [3]	402.81	376.14	376.25	338.34	165.92	160.65

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 66 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 because of rounding.

Source: United Nations. World Energy Supplies 1950–74. Statistical Paper, ser. J, No. 19, New York, 1976, pp. 280–335.

The Mineral Industry of Albania

By Nikita Wells [1]

In 1975, Albania maintained its position as the world's third largest producer of chromite, following the U.S.S.R. and the Republic of South Africa and provided 9.4% of the world's production. Other mineral commodities were also produced but were of little importance by world standards. These included nickeliferous iron ore, copper ore, blister copper, crude oil, petroleum products, lignite, natural gas, natural asphalt, and cement.

Albania's fifth 5-year plan (1971–75) fell short of many of its objectives. Its 7% annual growth compared unfavorably with the 12.5% of the fourth 5-year plan and with the 9% to 10% annual growth that was planned. Industry was to have a 61% to 66% growth during this period but reached only an estimated 50%.

Albania continued construction of industrial projects during 1975 with help from the People's Republic of China. Major projects included the Elbasan Metallurgical Combine (iron and steel complex) where the first blast furnace was to have been commissioned during 1975, the 1-million ton-per-year Ballësh petroleum refinery, the ferrochromium plant at Burrel, the copper smelter at Laç, the urea plant at Fier which is to double Albania's nitrogen fertilizer production, the 500-megawatt hydroelectric powerplant at Fierzë, and the Vlora polyvinylchloride plant.

Information on the performance of Albania's mineral industry is inadequate and largely inferential since little is published directly. Some statistical information was published in a special Albanian survey in 1973.[2] In general, Albanian reporting on minerals has been minimal. Albanian official sources do indicate, however, plans and plan fulfillments or relative growth rates in some areas. Therefore, most of the actual production data are estimated; the trade tables are compiled from returns of trading partner countries.

Government Policies and Programs.—The sixth 5-year plan (1976–80) will place particular emphasis upon the oil industry. Compared with 1975, crude oil production is to increase 11% in 1980. Special attention is to be given to exploration for new deposits in order to increase industrial reserves of oil and gas. Natural gas production is to increase 48%. The mineral industry is also to be rapidly developed during this period. In 1980, as compared with 1975, production of chromite is to increase more than 46%, copper ore more than 55%, and nickeliferous iron ore by about a factor of 3.3; coal (lignite) production is to double. Production of cement is to increase 55%.

Important ferrous metallurgy projects and new copper and chrome plants are to be commissioned during the sixth 5-year plan's industrialization program. In 1980, electric energy is to be increased about 2.2 times compared with that of 1975. The output of hydroelectricity is to triple when the Fierzë hydroelectric powerplant begins operation. Construction is also to be initiated on the hydroelectric powerplant at Kaman on the Drin River.[3]

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[1] Physical scientist, International Data and Analysis.

[2] 30 Vjet Shqiperi Socialiste 1974 (30 years of Albanian Socialism, 1974), Tirana, 1974.

[3] Zeri i Popullit (Tirana). Nov. 5, 1976, pp. 1–8.

PRODUCTION

Total industrial production in 1975 increased 4.4% over that of 1974. This, however, compares unfavorably to industrial production growth reported for earlier years. Although production targets as put forward by the fifth 5-year plan were not reached, the revised tasks set for 1975 were generally fulfilled. In 1975, the annual production plans were exceeded for chromite, copper, and nickeliferous iron ores, coal, pyrites, mineral fertilizers, and cement. The production of nickeliferous iron ore increased 61.3% in order to meet the goal of the plan for 1975. The production of chromite increased 9% and blister copper 7.2%. In the mineral fuels sector, natural gas production reportedly increased, meeting its upgraded 1975 plan goal. Production of lignite increased 5%.

Table 1.—Albania: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Chromium, chromite, gross weight ____________thousand tons__	611	715	779
Copper:			
Mine output, metal content [2] ____________________________	7,000	8,580	9,200
Smelter output (blister) __________________________________	7,000	8,580	9,200
Iron and steel:			
Iron ore, nickeliferous, gross weight ______thousand tons__	384	403	[e] 650
Semimanufactures (rolled angles, shapes, sections) _______	36,000	[e] 38,000	[e] 38,000
NONMETALS			
Cement, hydraulic __________________________thousand tons__	518	555	[e] 1,000
Fertilizer materials, manufactured:			
Nitrogenous ______________________________________do____	106	[e] 110	[e] 210
Phosphatic _______________________________________do____	110	[e] 110	[e] 120
Salt [e] ____	50,000	50,000	50,000
Sodium carbonate, calcined ________________________________	21,000	[e] 21,000	[e] 21,000
MINERAL FUELS AND RELATED MATERIALS			
Coal, lignite _________________________________thousand tons__	811	[e] 850	[e] 894
Gas, natural, gross production ____________million cubic feet__	6,710	[e] 7,170	[e] 10,590
Petroleum: [3]			
Crude oil:			
As reported ________________________thousand tons__	[r] 2,107	[e] 2,200	[e] 2,250
Converted ______________thousand 42-gallon barrels__	[r] 14,058	[e] 14,678	[e] 15,012
Refinery products:			
Gasoline ___________________________________do____	774	808	NA
Kerosine ___________________________________do____	271	[e] 310	NA
Distillate fuel oil __________________________do____	1,298	[e] 1,340	NA
Residual fuel oil ___________________________do____	2,085	[e] 2,200	NA
Lubricants _________________________________do____	42	[e] 70	NA
Other:			
Petroleum jelly and wax __________________do____	275	NA	NA
Asphalt and bitumen ______________________do____	5,890	[e] 6,100	NA
Petroleum coke ___________________________do____	28	NA	NA
Unspecified ______________________________do____	--	[e] 1,470	NA
Total ______________________________________do____	[r] 10,663	[e] 12,298	NA

[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 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—7.75; distillate fuel oil—7.46; residual fuel oil—6.66; lubricants—7.00; petroleum jelly and wax—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.

TRADE

Minerals and related products were the major portion of Albania's exports in 1975, as in previous years; only chromium ore was important by world standards. Other important exports in 1975, besides chromium ore, were crude oil, asphaltic flux, nickeliferous iron ore, blister copper, electrolytic copper, and copper wire.

Albanian imports were mainly capital goods to increase the economic self-sufficiency of the country. The main mineral and related products imported were coke, iron and steel semimanufactures, phosphate rock, and potash.

China was Albania's principal trading partner, with an estimated $230 million, or 70% of all trade in 1975. The second largest trading partner was Yugoslavia with a total trade of $60 million, followed by Italy with $32.2 million. Some other trading partners were Poland, West Germany, Austria, Romania, Greece, and the United States. In 1974, the United States imported $218,144 worth of chromite from Albania. U.S. imports and exports to Albania were both valued around $485,000 in 1974.

Trade statistics in table 2 and 3 were compiled from returns of trading partner countries.

Table 2.—Albania: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum	NA	146	Italy 137.
Chromite [2 3] thousand tons	[4 5] 466	356	Yugoslavia 131; Czechoslovakia 58; United States 51.
Copper metal:			
Unwrought	[3 4] 2,016	1,256	Italy 1,061; West Germany 195.
Semimanufactures	[4 5] 2,481	500	Yugoslavia 350; West Germany 150.
Iron and steel:			
Ore, nickeliferous, gross weight thousand tons	[4] 318	NA	
Scrap	4,000	3,327	All to Italy.
Silver, waste and sweepings value, thousands	$158	$177	Do.
NONMETALS			
Cement	NA	11,608	All to Yugoslavia.
Clays and clay products, nonrefractory	28,333	28,122	Do.
Sodium and potassium compounds: Soda ash	NA	2,916	Italy 1,463; Greece 1,199.
Stone, dimension, calcareous	1,560	767	All to Italy.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	NA	1,094	All to Yugoslavia.
Coal excluding briquets	744	NA	
Coke	1,900	NA	
Petroleum:			
Crude thousand 42-gallon barrels	[4] 2,749	579	Italy 402; Belgium-Luxembourg 134.
Refinery products:			
Gasoline do	NA	86	Italy 44; Belgium-Luxembourg 42.
Distillate fuel oil do	NA	37	All to Italy.
Bitumen do	1,302	1,499	Italy 656; Yugoslavia 407; Greece 283.
Bituminous mixtures do	[4 5] 5,860	NA	
Unspecified do	[3] 1	31	All to West Germany.

NA Not available.
[1] Compiled from the trade returns of the trading partner countries as reported by the Statistical Office of the United Nations in vs. 1, 2, and 3 of the World Trade Annual, 1973, Walker and Company, New York, 1975, and in the 1974 Supplement to the World Trade Annual, Walker and Company, New York, 1976, unless otherwise specified.
[2] Source: Official Czechoslovakian trade statistics.
[3] Source: Official Polish trade statistics.
[4] Source: Official Albanian trade statistics.
[5] Source: Official Romanian trade statistics.

Table 3.—Albania: Imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum metal including alloys, all forms [2]	r 1,201	1,513	Hungary 754; Yugoslavia 499; West Germany 160.
Iron and steel:			
Pig iron including cast iron and ferroalloys [3]	4,562	2,657	All from Poland.
Semimanufactures: [4]			
Bars, rods, angles, shapes, sections	30,300	20,400	Yugoslavia 9,830; Czechoslovakia 8,200.
Universals, plates, sheets	58,810	65,690	West Germany 17,400; Czechoslovakia 16,100; Poland 15,440.
Wire	20	120	Italy 100; Sweden 20.
Tubes, pipes and fittings	10,452	4,590	Czechoslovakia 2,800; Yugoslavia 1,180.
Hoop and strip	400	1,210	Japan 800; West Germany 300; Yugoslavia 110.
Rails and accessories	600	1,320	Italy 500; Czechoslovakia 500; Austria 320.
Lead oxides	--	103	All from West Germany.
Titanium oxides	--	91	Do.
Zinc:			
Oxide and peroxide	--	25	All from Yugoslavia.
Metal including alloys, all forms	--	140	Yugoslavia 75; West Germany 65.
Other nonferrous metals, n.e.s value, thousands	$79	$132	Yugoslavia $85; United Kingdom $46.
NONMETALS			
Asbestos, crude	543	745	All from Yugoslavia.
Clays and clay products:			
Refractory	1,088	216	Do.
Nonrefractory	34	36	Do.
Sodium and potassium compounds, caustic soda	1,000	524	Yugoslavia 424; Italy 100.
Sulfur:			
Elemental	NA	676	All from Greece.
Sulfuric acid	NA	1,565	All from Yugoslavia.
Other crude nonmetals, n.e.s value, thousands	$29	$7	Do.
MINERAL FUELS AND RELATED MATERIALS			
Coke [3] thousand tons	20	11	All from Poland.
Petroleum refinery products:			
Distillate and residual fuel oils [e 5] thousand 42-gallon barrels	141	141	NA.
Lubricants do	3	4	Italy 2; United Kingdom 2.
Other, unspecified do	22	NA	

e Estimate. r Revised. NA Not available.

1 Compiled from the trade returns of the trading partner countries as reported by the Statistical Office of the United Nations in vs. 1, 2 and 3 of the World Trade Annual, 1973, Walker and Company, New York, 1975, and in the 1974 Supplement to the World Trade Annual, Walker and Company, New York, 1976, unless otherwise specified.

2 Source: Official Hungarian trade statistics.

3 Source: Official Polish trade statistics.

4 Source: Statistics of World Trade in Steel 1973, United Nations, New York, 1974, and Statistics of World Trade in Steel 1974, United Nations, New York, 1975.

5 Source: World Energy Supplies, 1950–74, United Nations, New York, 1976.

COMMODITY REVIEW

METALS

Chromite.—In 1975, Albania was the world's third largest producer of chromite, with 9.4% of the world's total production, following the U.S.S.R. and the Republic of South Africa. It produced 779,000 tons, an increase of 9.0% over 1974 output. The original fifth 5-year plan called for a 900,000-ton ore production in 1975, but a later revision brought this figure down to 837,000 tons.

The four principal chromite mining areas are located at Pogradec, on the southern shore of Lake Ohrid; Klos, 50 kilometers northeast of Tirana; Elbasan, 40 kilometers southeast of Tirana; and near Tropojë and Kukës in the northern part of Albania. The average grade of Albanian chromite is 42% Cr_2O_3, 13% FeO, and 22% Al_2O_3, and the material is suitable for both metallurgical and refractory purposes.[4]

Construction continued during 1975 on the ferrochromium plant at Burrel, in the Mat District, which is to supply the Elbasan Metallurgical Complex. This plant is being constructed with the help of China and will permit the reduction of chromite inside Albania for the first time. By 1980 chromite production is to increase by more than 46%.

Yearly Albanian exports of chromite are about 450,000 tons of both metallurgical and refractory qualities. The bulk of these exports go to Yugoslavia, Italy, and Poland.

Copper.—Production of copper ore met plan goals by reaching 600,000 tons in 1975. Production of blister copper in 1975 had reached 9,200 tons, showing an increase of 7.2% over that of 1974 and exceeding the planned 5% increase. According to the sixth 5-year plan, copper production is to increase in 1980 by more than 55% over that of 1975. In 1973, Albanian exports included 2,016 tons of blister and 2,481 tons of copper wire.

In 1975 about 60% of the blister copper was to be converted into wire, and the remainder into refined metal, bronze, and brass.[5] The Mirditë District accounts for about 50% of Albania's copper ore production, 45% of the blister, and all of the electrolytic copper.

In 1975, Albania was continuing the construction of its third copper smelting plant at Laç, in the Kruja District, north of Tirana. This was one of the biggest copper industry projects of the 1971–75 plan. Albania's other two copper smelting plants are located in the Mirditë and Kukës Districts.

Albanian copper deposits are located in the north of the country in the Mirditë, Pukë, Kukës, and Shkodër Districts, where reserves are estimated at 50 million tons of low-grade ore.

Iron Ore, Nickeliferous.—Albanian nickeliferous iron ore production in 1975 reached an estimated 650,000 tons, a 61.3% increase over that of 1974. The production of this ore was to be increased 16% in 1976 and by a factor of 3.3 by 1980. This ore was exported up to 1974, but in 1975 it was to be used domestically at the Elbasan Metallurgical Combine.

Albania's most important nickeliferous iron ore mines are located near Lake Ohrid at Pishkash and Prrenjas in the Pogradec and Librazhd Districts. The ore is mostly mined by open pits and contains approximately 51% iron, 1% nickel, and 0.06% cobalt.

Three new mines were under construction at Prrenjas, Guri i Kug, and Cervenaka. A 45-kilometer railroad has been laid connecting Prrenjas to the Elbasan Complex. A railroad line was also under construction to link Guri i Kug to Prrenjas. These three mines were to be completed by yearend 1975; however, no reports of completions have yet appeared.

Iron and Steel.—Construction of the Elbasan Metallurgical Combine is Albania's largest current investment project. It is being built with the help of China and is to achieve an 800,000-ton-per-year capacity of all products including wire, sheets, bars, and other products. The first blast furnace was commissioned during 1975. The bulk of the equipment for this plant is coming from China, but some machinery has reportedly been purchased from West Germany.[6]

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[4] Industrial Minerals. No. 95, August 1975, pp. 25, 29.
[5] Probleme Ekonomike (Tirana). No. 5—6, May–June 1974, pp. 3–22.
[6] Vilaggazdasag (Budapest). Aug. 18, 1976, p. 2.

NONMETALS

Estimates had to be made on the production of Albanian nonmetals owing to the lack of available information for 1975. Production of pyrites, mineral fertilizers, calcined and caustic soda, and cement have surpassed their goals for 1975.

Cement.—According to Albanian sources, production of cement in 1975 had reached its planned goal. Earlier sources set this goal at 1 million tons. Production in 1980 is to increase 55% as compared with 1975. Albania now has two cement plants, which are located at Fusë-Krujë and Elbasan.

Fertilizer Materials.—The production of nitrogen fertilizers in 1975 surpassed its planned goal of approximately 210,000 tons. Phosphatic fertilizer production was estimated at 120,000 tons.

Albania has one nitrogen fertilizer plant, which is located at Fier and was built with the help of China. Here a urea plant was under construction during 1975 and is to double Albania's nitrogen fertilizer production upon full operation. It was to start operations in the middle of 1976.

MINERAL FUELS

The estimated production of primary energy derived from fossil fuels and hydroelectric generation increased from 4.25 million tons of standard coal equivalent in 1974 to 4.52 million tons in 1975. In 1975, Albania exported an estimated 1.36 million tons of standard coal equivalent, mostly in the form of oil. Albania's total primary energy consumption for 1975 reached an estimated 3.2 million tons of standard coal equivalent, an increase of 8.9% over that of 1974. Oil provided 62.9% of the total primary energy, while coal represented 20.4%, natural gas 12.6%, and hydroelectric energy 4.1%. The total primary energy balances for Albania for 1974 and 1975 are shown in table 4.

Table 4.—Albania: Primary energy balance for 1974 and 1975

(Million tons of standard coal equivalent [1])

Year	Total primary energy	Coal (lignite)	Crude oil and petroleum products	Natural and associated gas	Hydroelectric power
1974: [2]					
Production	4.25	0.60	3.23	0.27	0.15
Imports	.02	.02	--	--	--
Exports	1.35	--	1.30	--	.05
Apparent consumption	2.92	.62	1.93	.27	.10
1975: [3]					
Production	4.52	.63	3.31	.40	.18
Imports	.02	.02	--	--	--
Exports	1.36	--	1.31	--	.05
Apparent consumption	3.18	.65	2.00	.40	.13

[1] 1 ton of standard coal equivalent (SCE) = 7,000,000 kilocalories. Conversion factors used are lignite, 0.7; crude oil, 1.47; natural gas, 1.33 (per 1,000 cubic meters); hydroelectric power, 0.125 (per 1,000 kilowatt-hours). Source: United Nations. World Energy Supplies. Statistical Papers, Series J, No. 18, 1975.

[2] Data for 1974 reported in Zeri i Popullit (Tirana), Jan. 28, 1975, pp. 1–3.

[3] Data for 1975 obtained from various Albanian sources and estimates.

Albania is presently self-sufficient in all forms of energy and is exporting surplus crude oil and electric energy. It is also developing self-sufficiency in natural gas. Nearly 75% of Albania's electric power requirements are supplied by hydroelectric powerplants. In 1975, Albania produced approximately 2 billion kilowatt-hours of electric energy. The 250-megawatt powerplant, established along the Drin River, was exporting electric power to Yugoslavia. Albania's electric power production is to increase 21% in 1976.

Coal.—Albania's lignite production in 1975 was 894,000 tons, a 5% increase over that of 1974 and meeting the revised plan figure. The original planned production figure for 1975 was 1.25 million tons. Coal production is to increase 9% over that of 1975 in 1976 and is to double by 1980. More than 80% of this coal is to be obtained from existing mines and from their expansion. Plans have been made to beneficiate 60% of Albanian coal by 1980.

Albania's deposits consist of lignites and subbituminous coals having a calorific value of about 4,900 kilocalories per kilogram (8,800 Btu per pound). The largest deposits are near Korcë, at Memaliaj near Tepelenë, and in a triangular plateau with apexes at Tirana, Elbasan, and Lushnjë. Two new mines have gone into operation at Mushqeta and Mëzez.

Production was started in 1975 at the new mine at Valias, near Tirana, where a coal beneficiation plant was being built with help from China. The Memaliaj mine is expanding its production capacity and is to increase its output in 1976 by 20,000 tons.

Natural Gas.—Albanian natural gas production was approximately 300 million cubic meters. According to the original 1971–75 plan, the 1975 gas production was to be 255 million cubic meters, but the later 1975 revised plan called for the 300 million cubic meters. By 1980, natural gas production is to increase 48%. The large increase in gas production in 1975 is believed to be due to the recently discovered gas deposits in Diviakë and Budulinë in the Lushnje District. Albanian natural gas reserves are believed to be about 8 trillion cubic feet, but Albania has not released any definite reserve figures.

Petroleum.—Production of crude oil in 1975 was estimated at 2.25 million tons. By the end of the fifth 5-year plan (1971–75), Albania's crude production was to have reached 2.5 million to 2.7 million tons, but it fell short of its goal because of poor yields from oil wells. Crude oil production in 1980 is to be increased 11% compared with that of 1975. Exports of crude oil in 1974 were about 441,000 tons, and those of asphaltic flux approximately 1.0 million tons.

The Ballësh oil refinery is Albania's second most important investment following the Elbasan Metallurgical Combine. It is to have an annual capacity of 1 million tons. Construction of this refinery continued during 1975 with help from China. Once this refinery goes into operation it is to stimulate the petrochemical industry at Vlorë. The seaport of Vlorë is now connected to Albania's oilfields and refineries by an oil pipeline system. Albania's present estimated refining capacity is 2 million tons per year. The refinery at Fier has a capacity of 1 million tons per year, while the two refineries at Stalin and Cerrik have capacities of 500,000 tons per year each.

The Mineral Industry of Algeria

By John L. Albright [1]

Algeria's mineral industry was dominated by activities in petroleum and natural gas during 1975. Plans were being developed to enlarge handling and storage facilities for crude oil, refined petroleum products, petrochemicals, and liquefied natural gas (LNG) destined for export. A tanker loading area will be built at Alger to enable the export of about 230 million barrels of crude oil and 40 billion cubic meters of LNG per year. The State-owned Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures (SONATRACH) was actively engaged in all phases of the petroleum industry. The Export-Import Bank of the United States extended a loan of $47.7 million [2] to SONATRACH to be used to purchase additional equipment for the liquefication of natural gas for export, and a consortium of 46 international banks extended loans totaling $400 million to the Banque Exterieure d'Algeria and the Banque Nationale d'Algerie to be used for numerous development projects in the country including the construction of cement plants and natural gas pipelines. The loans will be repayable over a period of 4 years beginning in 1979. Société Nationale de Recherches et d'Exploitations Minières (SONAREM) continued to operate as Algeria's autonomous national mining company.

Algeria selected contractors to build petroleum and natural gas related industries, including ammonia and methanol plants. SONATRACH awarded contracts to Kellogg France, S.A. and Creusot-Loire Entreprise for the construction of a 1,000-ton-per-day ammonia plant at Annaba. Creusot-Loire will act as general contractor for the project. The plant will use natural gas as feedstock, and the ammonia produced will be marketed mainly in Algeria.[3] Production has been scheduled to begin in 1978, and the plant will employ approximately 350 people. SONATRACH and a group of 14 Japanese companies agreed to carry out a $500,000 study into the feasibility of building and operating a methanol export plant that would use natural gas feedstocks from the prolific Hassi R'Mel Field.

The Algerian State budget for 1975 set revenues at $5,569 million and expenditures at $5,533 million; oil taxes were placed at $3,292 million, or nearly 60% of the total revenue.

PRODUCTION

Algeria remained as one of Africa's leading producers of petroleum and natural gas. The largest producing oilfields in the country were in the east-central section of the country between Hassi Messaoud and I-N-Amenas, near the Libyan border. There were an estimated 869 wells in production during 1975, 3 more than in 1974, of which 211 required artificial lifting.

Most of the country's mineral industries recorded minor increases in production during 1975, but crude oil output de-

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

[2] Where necessary, values have been converted from Algerian dinars (DA) to U.S. dollars at the rate of DA3.9494=US$1.00.

[3] Oil Daily. Kellogg Technology to be Used in 2d Algerian Ammonia Unit. No. 5815, Jan. 23, 1975, p. 3.

creased by 17 million barrels to 350.8 million barrels during the year, due mainly to pressure problems at major fields. Algeria's natural gas industry experienced a production increase. During 1975, the production of iron ore declined by 570,000 tons, and Algeria's output of phosphate rock declined by an estimated 12,000 tons.

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

Commodity [1]	1973	1974	1975 p
METALS			
Antimony concentrate:			
Gross weight e	150	150	150
Metal content e	60	60	64
Copper concentrate:			
Gross weight	1,502	1,638	e 1,700
Metal content	353	377	e 391
Iron and steel:			
Iron ore, gross weight ---- thousand tons	3,135	3,820	3,250
Metal:			
Pig iron ---- do	359	276	e 245
Crude steel ---- do	r 87	250	e 244
Semimanufactures ---- do	NA	r 165	e 229
Lead concentrate:			
Gross weight	6,150	4,576	e 3,600
Metal content	3,876	3,000	3,000
Mercury ---- 76-pound flasks	r 13,300	e 13,300	e 13,300
Silver ---- thousand troy ounces	170	140	210
Zinc concentrate:			
Gross weight	25,478	19,167	e 19,500
Metal content	r 12,200	11,000	14,500
NONMETALS			
Barite:			
Crude	70,756	53,000	68,000
Cement, hydraulic ---- thousand tons	1,018	941	e 940
Clays:			
Kaolin	6,000	9,000	11,000
Bentonite	22,500	e 22,500	e 22,500
Diatomite	e 4,600	8,000	10,000
Fertilizer materials:			
Phosphate rock ---- thousand tons	611	802	e 790
Gypsum [2] and plasters ---- do	r 63	48	e 50
Lime, hydraulic [3] ---- do	12	12	e 11
Pyrite:			
Gross weight	12,020	e 12,000	e 12,000
Sulfur content	5,529	e 5,520	e 5,520
Salt ---- thousand tons	130	140	125
Sand and gravel, sand ---- thousand cubic meters [4]	--	60	--
Sodium compounds, caustic soda	3,000	3,000	NA
Strontium mineral, celestite, gross weight e	1,800	1,800	--
Sulfur, elemental e	20,000	20,000	20,000
MINERAL FUELS AND RELATED MATERIALS			
Coal ---- thousand tons	13	15	e 15
Gas, natural:			
Gross production e ---- million cubic feet	r 760,000	r 700,251	739,874
Marketed (including liquefied) ---- do	167,391	198,502	e 210,000
Natural gas liquids (condensate) ---- thousand 42-gallon barrels	r 12,071	12,006	e 17,900
Petroleum:			
Crude ---- do	400,515	368,139	350,753
Refinery products:			
Gasoline ---- do	7,399	6,096	6,771
Jet fuel and kerosine ---- do	2,683	2,920	3,523
Distillate fuel oil ---- do	8,534	13,724	11,647
Residual fuel oil ---- do	12,503	8,906	9,835
Other ---- do	6,777	1,168	6,969
Refinery fuel and losses ---- do	1,293	r 3,759	976
Total ---- do	39,189	r 36,573	39,721

e Estimate. p Preliminary. r Revised. 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

In 1975, Algeria exported large quantities of petroleum and natural gas mainly to Europe and the United States. Algeria was Africa's largest exporter of refined petroleum products to the United States, and shipments of crude oil from Algeria to the United States totaled 96.5 million barrels. The volume of crude oil delivered to the United States was more than twice that sold to U.S. companies during 1973, and nearly 31 million barrels larger than Algeria's crude oil sales to the United States in 1974. Oil shipments to the United States during 1973 and 1974 had been affected by the Arab oil embargo. Of the crude oil exported during 1975, more than one-half went to West Europe, one-fourth to North America, and the remainder to Asia, Latin America, and other areas.

France, Italy, the United States, and West Germany were Algeria's most important trading partners. Barter trade agreements were negotiated between Algeria and several foreign countries. One such agreement between Algeria and France involving an exchange of crude oil for highway trucks failed to be consummated. A $37 million agreement was concluded between Algeria and Sweden for trading 2.8 million barrels of crude oil for 1,200 trucks, along with a service center and training facilities.[4] SONATRACH did not renew its trade agreement with the Essence et Lubrifiant de France-Entreprise de Recherches et d'Activités Pétrolières (Elf-ERAP) oil concern of France during 1975, but increased its sales to Compagnie Française des Pétroles (CFP) also of France. In December 1975, the Algerians signed an agreement with CFP to buy back nearly 7.7 million barrels of CFP's crude oil during 1976.[5]

SONATRACH signed an agreement with Ecol Ltd. of the United States to supply 40,000 barrels of crude oil per day to Ecol's new petroleum refinery near New Orleans, La., over a period of 5 years beginning in 1976. The Algerian deliveries will meet 20% of the refinery's 200,000-barrel-per-day capacity. Another important agreement signed during the year was the one concluded with Ruhrkohle AG of West Germany, which called for the delivery of coking coal to Algeria in exchange for oil and natural gas. The Algerian companies involved in the transaction were SONAREM, SONATRACH, Société Nationale Algérienne de l'Electricité et du Gaz (SONELGAZ), and Société Nationale de Sidérurgie (SNS). Details of the agreement were not publicized.

[4] Middle East Economic Survey (Beirut, Lebanon). Algeria Uses Oil to Pay for Swedish Trucks. V. 18, No. 45, Aug. 29, 1975, p. 4.

[5] Petroleum Intelligence Weekly. What's New Around the World. V. 14 No. 50, Dec. 15, 1975, p. 8.

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

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal, including alloys, all forms	141	412	All to France.
Copper:			
Ore and concentrate	961	820	All to Bulgaria.
Metal including alloys, all forms	1,863	1,467	France 1,435.
Iron and steel:			
Ore and concentrate thousand tons	1,255	2,913	Romania 1,340; Belgium-Luxembourg 534.
Metal:			
Pig iron, ferroalloys, and similar materials	131,211	167,575	Italy 93,527; Spain 37,832.
Semimanufactures	6,729	2,999	France 2,621.
Lead:			
Ore and concentrate	5,085	77,183	All to Tunisia.
Metal including alloys, scrap	95	1,102	France 602; Egypt 500.
Magnesium metal, all forms	7	--	
Mercury 76-pound flasks	534	530	All to United States.
Nickel metal including alloys and scrap	34	22	All to France.
Thorium, ore and concentrate	--	724	All to Czechoslovakia.
Tin, scrap	68	--	

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

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Titanium, ore and concentrate	--	1,253	All to Tunisia.
Zinc:			
Ore and concentrate	7,677	3,556	Italy 3,071.
Metal including alloys:			
Scrap	648	481	All to West Germany.
Semimanufactures	8	--	
NONMETALS			
Abrasives, grinding and polishing wheels and stones kilograms	12	600	All to West Germany.
Cement, hydraulic	--	2,001	All to France.
Clays and clay products (including all nonrefractory brick):			
Crude clays, n.e.s.:			
Kaolin and bentonite	5,306	4,233	Poland 2,020; Spain 1,333.
Other	250	422	Italy 400.
Products: Nonrefractory	1	(1)	Mainly to France.
Diatomite and other infusorial earth	6,247	5,380	Italy 2,834; Morocco 1,107; France 749.
Fertilizer materials:			
Crude, phosphatic	218,455	353,784	France 100,026; Hungary 89,893; Czechoslovakia 83,640.
Ammonia	71,052	4,965	All to Greece.
Pyrites, unroasted	24,852	74,109	Belgium-Luxembourg 42,336; United Kingdom 20,350.
Salt	69,685	27,469	France 14,000; New Guinea 2,385; Nigeria 2,200.
Stone, sand and gravel:			
Dimension stone	4	52	France 41.
Gravel and crushed stone	1	--	
Sand excluding metal bearing	8	--	
MINERAL FUELS AND RELATED MATERIALS			
Gas natural, liquefied million cubic feet	93,825	120,416	France 68,222; United Kingdom 42,675.
Hydrogen, helium and rare gases	452	--	
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	352,501	279,491	United States 78,745; West Germany 75,066.
Refinery products:			
Gasoline do	4,943	7,623	Netherlands 2,312; United States 2,037.
Jet fuel and kerosine do	567	1,097	Brazil 160; Belgium-Luxembourg 147; Dahomey 136.
Distillate fuel oil do	2,680	3,599	West Germany 831; Netherlands 822; United States 349.
Residual fuel oil do	6,177	6,730	United States 3,098; Sweden 1,366; Japan 681.
Lubricants do	--	88	France 62; Greece 13.
Other do	147	360	United States 342.
Total	14,514	19,497	

[1] Less than ½ unit.

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

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Oxide and hydroxide	r 82	328	France 293.
Metal including alloys, all forms	5,260	7,754	France 3,625; Italy 823; Belgium-Luxembourg 791.
Antimony metal including alloys, all forms	41	77	West Germany 60; Belgium-Luxembourg 11.
Arsenic oxide and acid	10	30	Mainly from France.
Cadmium metal including alloys, all forms kilograms	82	(1)	All from France.
Chromium: Oxide and hydroxide	16	20	France 10; West Germany 9.
Cobalt: Oxides and hydroxides kilograms	192	241	France 232.
Copper:			
Copper sulfate	117	229	West Germany 188; Belgium-Luxembourg 39.
Metal including alloys, all forms	8,346	7,184	France 2,485; West Germany 1,016.
Iron and steel:			
Ore and concentrate	125,630	--	
Roasted pyrite	11	--	
Metal:			
Scrap	30	84	France 83.
Pig iron, ferroalloys, similar materials	9,104	3,499	France 1,583; West Germany 1,213.
Steel, primary forms	18,251	121,368	Japan 79,347; United States 13,790.
Semimanufactures:			
Rails and accessories	14,352	17,071	France 10,170.
Tubes, pipes, fittings	72,353	152,880	Japan 45,344; Canada 28,321; France 17,470.
Other	r 504,280	232,146	West Germany 73,360; Japan 41,610; France 40,683.
Lead:			
Ore and concentrate	5	5	All from Morocco.
Oxides	879	814	Mainly from France.
Metal including alloys, all forms	4,027	5,594	Tunisia 2,083; West Germany 3,695.
Magnesium metal including alloys, all forms	(1)	3	United Kingdom 1; West Germany 1.
Manganese:			
Oxides kilograms	452	465,344	West Germany 275,010; United States 150,000.
Mercury 76-pound-flasks	12	35	France 31.
Nickel:			
Ore and concentrate	--	(1)	All from Switzerland.
Metal including alloys, all forms	71	48	Czechoslovakia 26; France 12.
Platinum-group metals and silver including alloys:			
Platinum group troy ounces	r 514	1,672	Italy 739; France 578.
Silver do	r 92,530	35,559	France 25,785; Switzerland 7,105.
Rare-earth metals:			
Oxides kilograms	407	5	All from West Germany.
Metal including alloys do	185	380	West Germany 249; Italy 100.
Tin metal including alloys, all forms	101	445	United Kingdom 315.
Titanium:			
Ore and concentrate	107	111	All from Australia.
Oxide	1,630	2,945	West Germany 1,612; Italy 502; France 308; Japan 303.
Metal including alloys, all forms kilograms	144	--	
Tungsten metal including alloys, all forms do	r 1,743	183	United Kingdom 85; Italy 84.
Zinc:			
Oxide	327	751	West Germany 338; France 310; Italy 100.
Metal including alloys, all forms	4,642	4,116	France 1,844; Belgium-Luxembourg 599; U.S.S.R. 528.
Ore and concentrate	--	7,613	Mexico 7,443.
Other:			
Ore and concentrate	54	(1)	All from United States.
Oxides, hydroxides and peroxides, n.e.s	111	714	France 577.
Metals including alloys, all forms:			
Metalloids	56	51	France 27; United Kingdom 15; Japan 6.
Pyrophoric alloys kilograms	482	383	Mainly from Austria.
Zirconium ore and concentrate	2	1	All from France.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	39,665	49,117	Italy 40,828; Greece 7,550.
Grinding and polishing wheels and stones	341	375	France 131; Italy 103; Switzerland 70.
Dust and powder of precious and semiprecious stones kilograms	2	1	All from France.
Asbestos	2,449	3,872	U.S.S.R. 3,524.
Barite and witherite	31	10	All from West Germany.
Boron materials:			
Crude natural borates kilograms	8,112	2,179	United States 1,000; France 700; West Germany 435.
Oxide and acid do	152	24,094	Italy 19,840; France 3,354.
Bromine do	15	744	France 697.
Cement	1,123,065	1,813,569	Spain 949,513; Greece 306,903; U.S.S.R. 250,870.
Chalk	8,336	15,843	France 15,618; Spain 150.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Kaolin	7,500	6,143	United Kingdom 5,406; France 419.
Other	2,077	4,117	Morocco 1,199; United Kingdom 1,108; France 674.
Products:			
Refractory (including nonclay brick)	17,287	18,066	France 5,636; West Germany 3,708; United Kingdom 2,750.
Nonrefractory	2,688	3,418	Spain 1,236; Tunisia 887.
Cryolite and chiolite	--	315	France 200; West Germany 70.
Diamond, industrial value	r $2,257	$3,439	West Germany $2,783.
Diatomite and other infusorial earth	19	2	All from France.
Feldspar	44	1,344	People's Republic of China 585; Italy 400.
Fertilizer materials:			
Crude and manufactured:			
Nitrogenous	59,400	110,701	Romania 74,579; Bulgaria 18,179; United Kingdom 7,864.
Phosphatic	r 51,969	10,035	All from France.
Potassic	47,684	70,783	Spain 31,410; Italy 29,745; U.S.S.R. 9,626.
Other including mixed	40,730	10	All from United Kingdom.
Ammonia	3,350	57	France 53; West Germany 3.
Fluorspar	135	90	All from Belgium-Luxembourg.
Graphite, natural	r 3	57	West Germany 54.
Gypsum and plaster	241	9,235	Spain 4,348; Greece 3,958.
Iodine kilograms	99	130	United Kingdom 50; Belgium-Luxembourg 30.
Lime	2,712	3,359	France 1,625; Tunisia 1,080.
Magnesite	1,578	1,561	Greece 1,200; Austria 360.
Mica, crude, including splittings and waste	r 439	297	United States 277.
Pigments, mineral:			
Natural crude	380	88	France 87.
Iron oxides, processed	379	491	West Germany 330; Belgium-Luxembourg 118.
Quartz crystal kilograms	4	5	United States 4; France 1.
Salt and brine	3	31	West Germany 30.
Sodium and potassium compounds, n.e.s	14,080	9,615	Italy 6,047; Belgium-Luxembourg 2,502.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	323	3	Mainly from Belgium-Luxembourg.
Worked	20	17	People's Republic of China 8; Spain 6.
Dolomite, chiefly refractory grade	180	187	West Germany 100; France 87.
Gravel and crushed rock	16,796	33,702	Italy 33,508; France 194.
Quartz and quartzite	171	438	Belgium-Luxembourg 435.
Sand, excluding metal bearing	967	447	France 240; United States 136; Japan 70.
Sulfur:			
Elemental:			
Other than colloidal	93,692	83,172	Poland 67,758; Iraq 15,250.
Colloidal	550	--	

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Sulfur—Continued			
Sulfur dioxide	251	359	West Germany 348.
Sulfuric acid	8,243	27,153	United Kingdom 9,302; Spain 6,347; Italy 5,726.
Talc, steatite, soapstone, pyrophyllite	2,983	2,171	France 2,052; Austria 50; China 50.
Other nonmetals, n.e.s.:			
Crude:			
Vermiculite, perlite, chlorite	r 1	13	France 11.
Other	627	522	West Germany 473; Ethiopia 44.
Oxides and hydroxides of magnesium, strontium, barium	3	6	Belgium-Luxembourg 3; France 2.
Building materials of asphalt, asbestos and fire cement, and unfired nonmetals, n.e.s	10,067	5,753	France 3,987; Austria 1,110.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	40	32	United Kingdom 25.
Carbon black	1,830	1,716	Netherlands 469; Switzerland 362; Italy 229.
Coal, all grades, including briquets	59,523	47,390	U.S.S.R. 29,900; Romania 12,882; Morocco 4,321.
Coke and semicoke	260,235	198,088	U.S.S.R. 118,560; Italy 79,528.
Hydrogen, helium, rare gases	34	17	France 8; Morocco 7.
Peat	5	17	West Germany 16.
Petroleum:			
Crude thousand 42-gallon barrels	(1)	(1)	All from Belgium-Luxembourg.
Refinery products:			
Gasoline do	27	159	Spain 135; Netherlands 17.
Jet fuel and kerosine do	1	1	Mainly from Netherlands.
Distillate fuel oil do	72	75	Italy 45; Netherlands 30.
Residual fuel oil do	72	130	Italy 66; Netherlands 63.
Lubricants do	r 529	394	United Kingdom 377.
Other:			
Liquefied petroleum gas do	724	323	Spain 133; Italy 127.
White spirit do	24	19	Mainly from Netherlands.
Petroleum jelly and wax do	46	62	West Germany 48.
Asphalt and bitumen do	r 295	403	Spain 180; Albania 85; France 65.
Petroleum coke and flux do	6	4	France 3.
Unspecified do	47	735	Netherlands 703.
Total do	1,843	2,305	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	2,978	3,119	France 3,048.

r Revised.

1 Less than ½ unit.

COMMODITY REVIEW

METALS

Iron Ore.—A large iron ore deposit covering an area approximately 6 square kilometers was discovered in the Batna region of northeast Algeria. The ore content of the find was not reported.

SONAREM issued a contract to the French firm Fives Cail Babcock to expand storage and transportation facilities at the Bou Khadra and Ouenza iron ore mines.[6] The scheduled expansions will permit the combined annual production from these two mines to increase from 3 million to 5 million tons.

Iron and Steel.—SNS actively pursued plans to expand Algeria's iron and steel industry. Contracts valued at approximately $228 million were awarded to an 11-member consortium of foreign firms to expand the El Hadjar complex near Annaba. One contract, worth about $203 million, covered the expansion of rolling mills. The capacity of the hot rolling mills will be increased from 400,000 to 1.3 million tons per year, and that of the cold rolling mills will be enlarged from 120,000 to 700,000 tons per year. The second contract, valued at about $25 million, was for the installation of two drawn steel machines rated at 450,000 tons per year each.[7] During the year, a new blast furnace with a hearth diameter of 9 meters was completed at El Hadjar, and SNS signed a contract with a French firm for assistance in establishing several small steelworks in Algeria and supplying them with scrap.

SNS approved plans for a mill to be established at El Eulma, near Jijel on the northern coast, to produce chain, electrodes, welding rods, and wire. A West German company will supply the equipment, and the 50,000-ton-per-year plant should begin operations during 1977 at approximately 64% of its capacity.

Lead and Zinc.—Technoexportstroy of Bulgaria will construct a lead and zinc processing complex at 'Aïn Azel near the Kherzet Youssef mines, under the terms of a $10.5 million contract awarded to the firm by SONAREM. The project will provide for the annual production of 3,800 tons of lead concentrate and 20,000 tons of zinc concentrate, commencing in 1978. Nearly all of the zinc concentrate will be processed at the newly constructed electrolytic plant at Ghazaouet, adjacent to the border with Morocco.[8]

Mercury.—Algeria and five other countries (Italy, Peru, Spain, Turkey, and Yugoslavia) formed the International Association of Mercury Producers, with its headquarters in Geneva, Switzerland. The organization was formed to make joint technical studies, exchange information, monitor market prices, and promote the production and utilization of mercury.[9]

Uranium.—Algeria and West Germany held talks and initiated a feasibility study concerning the possible development of uranium ore deposits in the Ahaggar plateau in southern Algeria. The study was scheduled for completion in 1976.

NONMETALS

Barite.—SONAREM contracted a French firm to construct a plant at Chaib to process up to 50,000 tons per year of barite from nearby mines. Algeria's Mizab plant, built in 1972, had a capacity to produce up to 70,000 tons of barite per year.

Cement.—Société Nationale de Matériaux de Construction (SNMC) issued contracts to French and Japanese firms to construct cement plants in Algeria with a combined capacity of 2.5 million tons per year. Creusot-Loire of France will build two of the plants. One will be located about 3 kilometers south of Beni Saf (on the northwestern coast near Oran) and the other will be located at Hamma Bouziane (about 5 kilometers northwest of Constantine). Each will have a capacity to produce 1 million tons of cement per year, and both will become operational in 1978. Kawasaki Heavy Industries, Ltd., of Japan won a contract to build a 500,000-ton-per-year facility at Saïda, south of Mascara, scheduled for completion by mid-

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6 Nouvelles Economiques. Contract for the Expansion of the Ouenza and Bou Khadra Iron Ore Installations. No. 155, Apr. 1, 1975, p. 9.

7 Industries et Travaux d'Outre-Mer. Expansion to El Hadjar Integrated Steel Complex. V. 23, No. 263, October 1975, p. 807.

8 Nouvelles Economiques. Algerian-Bulgarian Contract to Realize Mining Complex. No. 155, Apr. 1, 1975, p. 9.

9 American Metal Market. Mercury Producers Meet in Geneva, Form Promotional Association. V. 82, No. 78, Apr. 22, 1975, p. 7.

1977. Construction of that plant reportedly began in 1975.

SNMC's 1-million-ton-per-year plant at Meftah (near Alger), which had been under construction since 1970, was readied for operation in 1975.

Cimenterie Algéro-Tunisienne (CIMAT), a joint Algerian-Tunisian company, signed a contract with the French company Société des Ciments Français for engineering and supervising the construction of a 1-million-ton-per-year cement plant in west-central Tunisia, near the Algerian border.[10] Originally planned to begin operations in 1976, CIMAT will commence partial production in 1979. In 1973 Algeria and Tunisia chose Djebel Boulahneche, Tunisia, as the site for their jointly-owned cement plant.

Fertilizer Materials.—SONATRACH finalized plans for the construction of nitrogenous fertilizer plants at Annaba and Arzew. Ammonia plants rated at 1,000 tons per day, utilizing feedstocks of Hassi R'Mel natural gas, will be constructed at both locations, and the company planned to build ammonium nitrate and nitric acid producing units adjacent to the ammonia plants.[11] SONATRACH also developed plans to establish plants at Annaba and Tébessa to produce phosphoric acid and sulfuric acid.[12]

SONAREM contracted a French firm to build a second unit for processing phosphate rock at Djebel Onk, with a capacity of 900,000 tons per year of refined phosphate,[13] and the company plans additional expansions to raise Algeria's phosphate rock processing capacity to 3.6 million tons per year by 1979.

Lime.—A Hungarian firm will build an $18.5 million lime plant at Saïda rated at 100,000 tons of hydrated lime and 48,000 tons of quicklime per year. The new plant will satisfy domestic demand for lime, and it will permit Algeria to become an important exporter of the commodity.

Salt.—SONAREM issued a contract to the Dravo Corp., of the United States, to construct a rock salt processing plant at El Outaya, near Biskra to produce annually 70,000 tons of chemical salt for the plastics complex at Skikda; 40,000 tons of table salt; and 30,000 tons of coarse rock salt for unspecified use. Further expansions may raise the annual output of chemical salt to 360,000 tons and that of table salt to 80,000 tons.

Stone.—*Marble.*—SONAREM signed a contract valued at about $4 million in 1975 with an Italian firm to build a marble processing plant at Sig, near Oran, to produce 80,000 cubic meters of finished natural marble per year.

MINERAL FUELS

Natural Gas.—Proved reserves of natural gas were estimated to be 3.3 trillion cubic meters at yearend 1975, an increase of about 0.5 trillion cubic meters from yearend 1974. SONATRACH carried out the production and exporting of natural gas, and SONELGAZ was responsible for marketing gas to domestic consumers. Algeria took steps during 1975 to enlarge its facilities for processing and handling LNG destined for foreign markets. Chemical Construction Corp. (Chemico) of the United States encountered delays in building the huge liquefaction/export terminal at Bettioua, near Arzew, and SONATRACH dismissed the company from the project[14] and subsequently awarded a contract to complete the complex to Bechtel International Inc. of the United States. The Bettioua plant, known as LNG-1, had been scheduled to begin deliveries to the United States in 1977.

SONATRACH was actively engaged in negotiating sales contracts with foreign utility companies during 1975. The El Paso Co. of the United States and SONATRACH negotiated a contract for delivery of 10 billion cubic meters of LNG per year over a 20-year period beginning in 1981, replacing an earlier agreement that failed to receive approval of the U.S. Government. Algeria signed a sales agreement in 1975 with Eascogas, a venture of Algonquin Gas Transmission Co. and Public Service Electric and Gas Co. of New Jersey, for the supply of LNG at the rate of

[10] Industries et Travaux d'Outre-Mer. The Société des Ciments Français will Cooperate in Realizing the Cimenterie Algéro-Tunisienne (CIMAT). V. 23, No. 225, February 1975, pp. 148–149.

[11] European Chemical News. Chem Systems Aids Algerian Projects. V. 27, No. 708, Oct. 24, 1975, p. 38.

[12] Middle East Economic Survey (Beirut, Lebanon). SONATRACH Invites Tenders for Two Phosphate Fertilizer Complexes. V. 19, No. 10, Dec. 26, 1975, p. 5.

[13] Industries et Travaux d'Outre-Mer. A Second Unit to Treat Phosphates at Djebel Onk. V. 23, No. 263, October 1975, p. 808.

[14] Oil Daily. SONATRACH Drops LNG Contractor, Still Sees Gas Deliveries in '77. No. 6017, Nov. 11, 1975, pp. 1, 26.

1 billion cubic meters per year during the period 1977 to 1979 and 6 billion cubic meters per year for a 20-year period beginning in 1980. Panhandle Eastern Pipe Line Co. signed a contract with SONATRACH for the purchase of natural gas from Algeria at the rate of 4.5 billion cubic meters annually for 20 years, replacing a 1973 contract for the same quantity of gas.

In 1972, a consortium of West European companies negotiated an agreement with Algeria for future supplies of natural gas and the sales agreement was renegotiated during 1973. However, in 1975 the consortium members were unable to agree to SONATRACH's terms concerning the sale, and the project was abandoned. During 1975, Algeria negotiated a contract with Gaz de France for about 4 billion cubic meters of natural gas and with the Société de Distribution du Gaz S.A. (of Belgium) for the sale of 70 billion cubic meters of natural gas over a 20-year period beginning in 1979, with the option for an additional 1.5 billion cubic meters per year. In 1975, SONATRACH also concluded an important sales contract with Empresa Nacional del Gas (Enagas), the Spanish national gas company, for the supply of LNG from Algeria to Spain for a period of 20 years beginning in 1976, at the rate of 4.5 billion cubic meters per year.

Algerian deliveries of LNG to Distrigas Corp. of the United States resumed in 1975, for the first time since late in 1973 when equipment problems at the Skikda plant cut off supplies. SONATRACH operated three liquefaction units at Skikda during 1975, and a fourth unit was under construction. Two more liquefaction units are to be added to the Skikda complex. Algeria will sell about 950,000 cubic meters of LNG to Distrigas during the period July 1976 through December 1977.

Pritchard International Corp. of the United States was awarded a $160 million contract by Algeria for the construction of a natural gas processing plant at Hassi R'Mel that will produce annually some 3.5 million tons of condensate and 18.3 billion cubic meters of dry gas.[15]

The Government devised a new pricing system for its natural gas that tied future prices to those of fuel oil marketed in the United States and in the Netherlands.[16]

Algeria awarded contracts to the Italian Group, Ente Nazionale Idrocarburi (ENI) to construct several pipeline links in Algeria. A 520-kilometer, 71-centimeter-diameter condensate line will be built from the Hassi R'Mel gasfield to Arzew, and a 160-kilometer, 102-centimeter-diameter gas pipeline will be laid from the Gassi Touil Field to Hassi Messaoud. The Italian firm will also build tanker-loading facilities at Arzew. During 1975, Saipem S.p.A. of Italy completed the 507-kilometer, 102-centimeter-diameter natural gas pipeline from the Hassi R'Mel gasfield to Arzew, under construction since 1972. Negotiations were held between Algeria and France, and the two countries agreed to build a long-distance natural gas pipeline across the Mediterranean Sea. Two possible routes were to be examined, one along the Moroccan coast and across the Straits of Gibraltar to Spain and France and the other crossing the Mediterranean Sea between Mostaganem, Algeria, and Almería, Spain, and to France bypassing Morocco. Société d'Etudes du Gazoduc de la Mediterranee Occidentale (SEGAMO), an organization jointly owned by Algeria, France, and Spain, awarded a contract to a French group to study the routes for the pipeline. The ultimate capacity of the Mediterranean pipeline will be 40 billion cubic meters of natural gas per year.

Petroleum.—Oil reserves were estimated to total 10 billion barrels at yearend 1975, an increase of nearly 1 billion barrels from the reserves at yearend 1974. In 1975, 103 wells were drilled for a total of 248,850 meters, compared with 123 wells for 237,500 meters during 1974. The 1975 drilling produced the following wells: 65 oil, 10 gas, 12 water, 6 water injection, and 2 gas injection. Eight of the wells were abandoned as dry holes.[17] The only discovery reported in Algeria during 1975 was that by Petrobrás Internacional S.A. (Braspetro) of Brazil. Its find tested 3,465 barrels per day of 35° API crude oil from a well drilled near Biskra in Eastern Algeria. Algeria awarded a contract valued at about $36 million to

[15] Middle East Economic Survey (Beirut, Lebanon). Pritchard Wins Hassi R'Mel Gas Treatment Contract. V. 18, No. 12, Feb. 14, 1975, p. 8.

[16] Petroleum Intelligence Weekly. Algeria Devises Complex Floor Price System for Gas. V. 14, No. 8, Feb. 24, 1975, p. 3.

[17] World Oil. Algeria. V. 183, No. 3, Aug. 15, 1976, p. 136.

a French firm for the construction of four high-pressure water injection stations to be used in secondary recovery operations in Algeria's oilfields. Three of the stations, with a combined capacity to inject 66,000 cubic meters of water per day, will be built at the Hassi Messaoud oilfields; and the fourth station, rated at 12,000 cubic meters of water per day, will be constructed at the Champ de Rhourd el Baguel oilfield.

Hispanica de Petroleos, S.A. (Hispanoil) of Spain planned to drill two delineation wells at El Meharis between Ghardaïa and Guerara in central Algeria, where its discovery well flowed 44° API crude oil at the rate of 2,200 barrels per day in 1974.

During the year negotiations broke down between SONATRACH and Elf-ERAP, the French State oil concern, for future crude oil deliveries to the latter, and the two companies did not renew their crude oil agreement. However, negotiations between SONATRACH and CFP resulted in an agreement whereby CFP will increase its liftings of oil from Algeria to France to 76.6 million barrels per year up to 1980; a 1971 agreement had permitted CFP to lift about 53.6 million barrels of Algerian crude oil per year. Under the terms of the new agreement, CFP will invest $90 million exploring for oil in new zones in Algeria over the next 5 years.[18]

The selling price for Algeria's crude oil was set at $12 per barrel during the first quarter of 1975, reduced to $11.75 per barrel during the second quarter of the year, and raised to $12.75 per barrel in October 1975. During the third quarter of 1975 SONATRACH publicized a new pricing system that would become effective on January 1, 1976. The proposed system was designed to keep basic sales prices constant for a year and maintain their competitiveness by means of a monthly price index formula that would reflect changes in freight and quality values.[19]

Algeria's refineries operated at about 86% of capacity during 1975. The following tabulation gives the output, in tons, of the Algier and Arzew refineries during the year:

Product	Algier	Arzew	Total
Butane	70,518	93,260	163,778
Diesel oil	68,632	--	68,632
Fuel oil	593,260	794,854	1,388,114
Gasoline	490,103	306,532	796,635
Gas oil	725,088	767,476	1,492,564
Kerosine and jet fuel	224,213	224,587	448,800
Lubricating oil	--	1,965	1,965
Naphtha	227,016	349,273	576,289
Propane	5,228	8,349	13,577
Other	--	88,667	88,667
Losses	73,518	56,653	130,171
Total	2,477,576	2,691,616	5,169,192

Source: OAPEC News Bulletin. Statistics. V. 2, No. 10, October 1976, p. 20.

Statistics were not available for the 1975 output of the small Hassi Messaoud refinery.

SONATRACH signed contracts with two European companies to construct a 150,000-barrel-per-day petroleum refinery at Bejaïa, on the northern coast near Jijel, to process crude oil from the Hassi Messaoud oilfields. It was scheduled to begin operations in 1979, and will produce butane, fuel oil, gas oil, gasoline, jet fuel, naphtha, and propane.[20] The Algerians also contracted with two Japanese companies, the C. Itoh Commercial Group and Japan Gasoline Co., Ltd., to expand the bitumen production units at the Arzew refinery. The capacity of the bitumen section will be increased from 65,000 to 140,000 tons per year. SONATRACH also invited bids for the development of plans and the supply of equipment for construction of a lubricating oil research laboratory.

[18] Arab Oil and Gas. SONATRACH-CFP Joint Venture Agreement Renewed for the Period 1976–1980. V. 4, No. 85, Apr. 1, 1975, pp. 11–12.

[19] Petroleum Intelligence Weekly. Algeria's New Pricing Idea Draws Mixed Reactions. V. 14, No. 33, Aug. 18, 1975, p. 8.

[20] Arab Oil and Gas. Procon and Technipetrol to Build a 7.5 Million-Ton/Yr. Refinery at Bejaia. V. 4, No. 80, Jan. 16, 1975. p. 20.

The Mineral Industry of Angola

By Janice L. W. Jolly [1]

During 1975, the mineral industry of Angola suffered a complete collapse, except for the petroleum sector. Although crude oil production and petroleum refinery throughput were down compared with 1974 production, they continued at a fairly high rate through most of 1975. Taxes and royalties accruing to the Government from crude oil production exceeded $500 million in 1975, and constituted 53% of the total revenues allotted for the 1975 general budget. Cabinda Gulf Oil Co. continued to produce from its offshore wells throughout 1975, little affected by the civil war, but ceased crude petroleum production temporarily in December 1975. Diamond production, however, was completely disrupted through most of 1975, and iron ore production ceased altogether in August.

An interim government was sworn in on January 31, 1975, to carry Angola through to independence on November 11, 1975. Under the Penin agreement signed on January 15 between three Angolan nationalist movements—the Movimento Popular para a Libertação de Angola (MPLA), the Frente Nacional para Libertação de Angola (FNLA), and União Nacional para a Independência Total de Angola (UNITA)—the interim government would be shared by a three-man presidential council, one from each movement. Within 2 weeks minor clashes started and continued intermittently until June 1975 when another peace agreement was signed in Kenya. By August, however, an allout civil war had broken out with MPLA on one side and FNLA and UNITA on the other.

Early in 1975, even before the civil war, Angola was on the brink of economic and political collapse due to the inability of the transitional government to control armed members of liberation movements. In the first 3 months of 1975, a survey showed that employment among 110 companies declined 13% while wages rose 50% and worker productivity fell between 34% and 50%. Sales declines were as much as 90% for most of the companies. Industries that imported raw materials were on the verge of closing down because of port congestion and workers' strikes. Early in 1975, the transitional government had agreed on a plan for State participation in the economy to take effect after November 11. The main features were establishment of a central bank and a new Angolan currency. The conversion of the Banco de Angola into a State-owned commercial bank was agreed upon with no other commercial banks to be established. The State was to have at least 51% ownership in all banks and insurance companies, which, in addition, could not operate in Angola unless a 70% share, which included the Government's share, was in Angolan hands. The Angolan Government was to take 50% interest or more in all mining and petroleum companies. Firms whose main business activities were in Angola were to transfer their head offices to Luanda by September 1. Some contracts were negotiated with the transitional government only to be renegotiated in 1976 with the new MPLA government. Angola achieved independence on November 11, 1975, Portuguese officials and the Portuguese army departed, and the deterioration of the Angolan economy continued. Transport and

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[1] Physical scientist, International Data and Analysis.

communications deteriorated as roads and railways were destroyed. Most factories and mines ceased operations and many installations were damaged. Only approximately 20,000 of the original 500,000 Portuguese settlers remained.

PRODUCTION AND TRADE

Since no reliable, complete production data were available at the time of this report, the estimates for 1975 mineral production that follow have been based on partial reports. Diamond production amounted to about 27% of the 1974 production of approximately 2.0 million carats. Most of this production was in the first half of 1975 at the rate of 40% of the previous year. Diamond production was about 15% of the 1974 production rate in the second half of 1975. Petroleum production was estimated at 58 million barrels for 1975, down 6% from that of 1974. Cabinda Fields were producing at the rate of 140,000 barrels per day for 10 months of 1975 and 30,000 barrels per day for November; no output was reported in December when Gulf Oil Corp. ceased production. The onshore wells of Companhia de Petróleos de Angola (PETRANGOL) averaged about 15,000 barrels per day for 1975. Iron ore production was estimated to be 2.6 million tons for 1975, down 50% from that produced in 1974. The Cassinga mine closed in August 1975. Iron ore exports in 1975 went to Japan (1,431,000 tons), West Germany (602,000 tons), France (401,000 tons), and the United States (216,000 tons). In 1975, the United States, as in 1974, was the major market for Angolan oil, taking 50% of the exports. It was followed by Portugal with 25% and Canada with 14%. Portugal emerged as the second major market in 1974 because of the Arab oil boycott. Petroleum refinery throughput for 1975 at the PETRANGOL Luanda refinery amounted to 5.1 million barrels of refined products compared with 5.4 million barrels for 1974. Gulf also produced approximately 160,000 barrels of diesel fuel for company use from its small Cabinda refinery. The Gulf Cabinda refinery has a capacity of 450 barrels of diesel fuel per day which is for ship use only and not sold.

Most trade, imports and exports, was severely constricted in 1975. Strikes and inadequate harbor facilities led to severe congestion and delays in cargo handling. As early as May 1975, delays of up to 60 days at the Port of Luanda caused the Associated Central West African Lines (CEWAL) to increase surcharges from 50% to 60% on incoming freight. The United Kingdom-West Africa Conference later raised surcharges on both inward and outward traffic to 70% for Luanda. Some shipping companies refused to call at Luanda because of long delays. During the first quarter of 1975, only 352 ships called compared with 569 ships for the same period in 1974. The benefits of new improvements added in 1974, which enabled the Benguela railroad to double its freight capacity, were short-lived because of continued port congestion at Lobito. By late 1975, the United Kingdom-West Africa Conference had imposed a 100% surcharge on Lobito port traffic causing the Zambians to divert copper exports from Lobito to other routes. In August 1975, and again by early 1976, sabotage along the Benguela railroad had also made this route untenable for either Zairian or Zambian mineral traffic. Transportation in general became an acute problem in Angola. Before the war, most of the blue-collar workers and technical people who worked on the Benguela railroad were Portuguese. Most of these fled, leaving the railway seriously understaffed.

Table 1 gives the production of primary minerals and processed metals and nonmetals. The latest available statistics on foreign trade in mineral commodities are given in the 1973 Minerals Yearbook chapter.

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

Commodity	1973	1974	1975 p
METALS			
Beryllium, beryl, gross weight	115	r e 90	e 30
Gold, mine output, metal content:			
Placer ... troy ounces	e 40	NA	NA
Vein ... do	e 1,160	NA	NA
Total ... do	e 2,000	2,000	e 1,000
Iron ore and concentrate, gross weight ... thousand tons	6,052	e 5,170	2,600
Manganese ore and concentrates, gross weight	4,682	--	--
NONMETALS			
Cement, hydraulic ... thousand tons	768	760	e 350
Clays, kaolin	667	r e 400	e 400
Diamond:			
Gem ... thousand carats	1,594	e 1,568	e 400
Industrial ... do	531	e 392	e 135
Total ... do	2,125	e 1,960	e 535
Gypsum	46,655	e 40,000	e 40,000
Salt	96,717	r e 100,000	e 100,000
Stone:			
Dimension:			
Granite blocks	7,578	e 6,000	NA
Marble blocks	1,201	e 1,000	NA
Other, limestone	e 700,000	NA	NA
Talc e	100	100	100
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	49,637	e 40,000	e 40,000
Natural gas:			
Gross production e ... million cubic feet	36,000	37,500	35,000
Marketable production e ... do	2,300	2,400	2,300
Petroleum:			
Crude ... thousand 42-gallon barrels	58,852	61,392	57,943
Refinery products:			
Gasoline ... do	542	546	386
Jet fuel ... do	566	563	619
Kerosine ... do	157	157	76
Distillate fuel oil ... do	778	785	1,072
Residual fuel oil ... do	2,895	2,934	2,635
Other ... do	98	97	147
Refinery fuel and losses ... do	302	332	135
Total ... do	5,338	5,414	5,070

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, 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

Iron Ore.—Operation of the Companhia Miniera do Lobito S.A.R.L. (CML) Cassinga iron mine ceased in August 1975 and moves to transfer CML's headquarters from Lisbon to Luanda were postponed. It was understood that no stockpile remained at the Moçâmedes shipping terminal and that all technical personnel had left Cassinga. CML was approximately 85% government-owned and all CML directors were government officials, thus the question of ownership and provision of skilled management to operate the mine and port were to be negotiated between Portugal and Angola. The company was reportedly bankrupt and its high-grade hematite ore was about used up. Plans for a pelletizing plant and suitable upgrading measures for the low-grade ore reserves were postponed. Financing for these plans was to come from South African Industrial Development Corp. and Union Corp. (51%), with Fried. Krupp Hüttenwerke AG of West Germany, USINOR of France, the British Steel Corp., and CML providing the balance. Iron ore reserves at Cassinga were estimated to be 100 million tons of eluvial hematite ore with 61% iron, and 2 billion tons of itabirite ore with 40% to 50% iron. The taconite ore at Cassala-Quitungo was estimated to be 92 million tons with an average 32.5% iron. In February 1975, Cia. do Manganés de Angola (CMA) announced its Cassala project would be postponed.

NONMETALS

Diamond.—A general description of diamond occurrences and the history of their development in Angola was given in a recent Bureau de Recherches Géologiques et Minieres (BRGM) report.[2] It was pointed out that in about 40 years, Angola had produced about 36 million carats of diamond—3% by weight and 7.5% by value of the world's diamond production. The Portuguese Companhia de Diamantes de Angola (DIAMANG) was the major producer. However, in the DIAMANG 1974 company report, it was recognized that the expected Angolan independence was to bring about a new era. It was unlikely that DIAMANG was to continue operations much longer under the previous structure. Hopes for establishing effective relations with the new government was the company's major objective to ensure survival. Negotiations began in 1975 and were to continue into 1976 with the new MPLA government. DIAMANG was already paying over 50% of its profits to Angola, but its capital was mostly private, with 45% of the Portuguese-chartered company held by national and private Portuguese concerns and the rest shared by U.S., Belgian, and South African interests, notably Anglo-American Corp. and De Beers Consolidated Mines, Ltd.

DIAMANG reported that the company finances deteriorated substantially during 1974 as a result of late deliveries, chaotic port conditions, steady exodus of trained personnel, and a marked breakdown in discipline and work output. Diamond smuggling in Angola reached alarming proportions. By May 1975, it was estimated that about 50% of DIAMANG's output was being siphoned off into illicit trade by the DIAMANG work force and the company had no choice but to temporarily stop mining activities. At yearend, some diamonds were apparently still being mined by about 6,000 black African miners (from the original 20,000) who reportedly remained at the mines all during the war. All of the 2,500 European technicians had left early in 1975. It was suggested that output in 1975 had fallen around 70%. It was doubtful whether more than 4 to 5 months of full production was achieved. The company was reportedly paying royalties to MPLA which had effective control of the area.

Phosphate Rock.—In 1975, it was reported that Ammoniaco Portuguese had plans for a $40 million fertilizer complex using phosphate rock occurring at Caala. The development of the Cabinda phosphate rock resources by Companhia dos Fosfatos de Angola (COFAN) was being put aside until new guidelines for mineral development could be worked out with the new government. The Annual Report of the South African Council for Scientific and Industrial Research (CSIR) disclosed results of a survey carried out by the CSIR in conjunction with the marine biology unit of the University of Cape Town. Deposits of marine phosphates and glauconite considered to be of industrial importance were reported as occurring off the mouth of the Cunene River situated between the Angola and the Territory of South-West Africa border.

MINERAL FUELS

Petroleum.—In early 1975, Texaco Petroleum of Angola, operating in partnership with Belgian Petrofina S.A., Sociedade Portugues de Exploracao de Petróleos S.A.R.L. (ANGOLA), and PETRANGOL, struck encouraging oil shows in two separate areas northwest of Luanda. The offshore field discovered by Texaco near the small town of Santo Antonio do Zaire at the mouth of the Congo River was described as 10 times larger than Cabinda resources.[3] Recent oil strikes by Cabinda Gulf Oil in partnership with Japanese and Belgian interests were due to come onstream at an initial rate of 25,000 barrels per day in November; however, at that time fighting had spread to Cabinda and Gulf Oil cut production from an average 140,000 to 30,000 barrels per day and evacuated most of its staff. Gulf maintained more than 250 employees in Cabinda to man 120 offshore wells. Gulf suspended operations altogether on December 22, 1975, at which time Gulf deposited about $100 million in accrued taxes

[2] Bardet, M. G. Geologie du Diamant, Deuxième Partie: Gisements de Diamant d'Afrique (Geology of Diamond, Second part: Diamond Deposits of Africa). BRGM Mémoires, No. 83, 1974, pp. 129–139.

[3] Quarterly Economic Review (London). Angola, Mozambique. No. 1, Feb. 19, 1975.

and royalties into a special interest-bearing account for future payment following a solution to the civil war. Gulf had been making payment to the transitional government until September 1975. At the time of the last quarterly payment of $116 million to the Bank of Angola, MPLA was in control of the capitol (Luanda), the Bank of Angola, and the transitional government. The next payment was to have been due December 31. Production onshore by the PETRANGOL Group, 25% held by Texaco, had reached 25,000 barrels per day by mid-1975 but was suspended by late January 1976. The PETRANGOL-ANGOL-Texaco pumping facility (Northern Angolan Petrangol Oil Co.) at Cabeca de Cobra was under FNLA control late in 1975.

In early 1975, the Angolan Government announced it would raise oil royalties from 12.5% to 16.7%, and the profits tax from 50% to 65.75%. Gulf Oil negotiated a new contract in which the transitional Angolan Government was to acquire 55% participation in the firm. It was also envisaged that the Government might also gain control of the Petrofina and Texaco producing consortium. However, by early 1976, renegotiation of all contracts with the new MPLA government became necessary.

PETRANGOL's Luanda petroleum refinery, running primarily on Angolan crude, had a processing capacity of 32,100 barrels per day and was to have been expanded to 40,000 barrels per day by the end of 1976. On January 30, 1975, PETRANGOL employees went on strike for better wages and working conditions, paralyzing all operations at the refinery. As the civil war picked up in intensity in August 1975, periodically there were severe shortages of gasoline and liquid petroleum gas in Luanda.

The Mineral Industry of Argentina

By Walter C. Woodmansee [1]

The Argentine mineral industry made little progress and some sectors deteriorated in 1975. It was a period of severe economic disorder with worsening inflation, a growing fiscal deficit, a heavy balance of payments deficit, major wage increases, slack demand, and labor disorders. Inflation was at an average rate of about 250% for the year and was at an annual rate of 300% in December. Several major currency devaluations throughout the year spurred inflation and labor problems. Early in the year, the exchange rate was 15 pesos to the U.S. dollar in the official financial market; by yearend, the rate had changed to 60 pesos to the dollar in the same market. Conditions worsened as the year progressed.

Despite this adverse economic situation, there were some positive factors in the mineral industry. In the metals sector, expansion was underway or planned for aluminum, copper, iron ore, iron and steel, manganese, and tungsten. A large new copper ore body was under development, and the project was to include smelter and refinery facilities. The National Iron and Steel Plan called for ambitious growth in iron ore mining and steelmaking, including new direct reduction plants. Financing for these programs through loans from international organizations was under negotiation during the year.

In the nonmetals sector, softening demand for construction materials such as cement, sand, and gravel caused slowdowns. Argentina's first sodium carbonate plant was planned, and fluorspar deposits were under investigation.

In the mineral fuels sector, a National Energy Plan called for accelerated exploration for new coal, oil, and gas resources, including foreign participation. New coal mine and washing facilities were under development. Additional gas pipelines were under construction. Prospects, particularly offshore, appeared favorable for significant new oil and gas discoveries. Construction of Argentina's second nuclear powerplant, in Cordoba Province, was delayed by contract negotiations, and schedules for two additional plants were temporarily deferred.

Restrictive laws and policies, the serious economic problems, and political instability produced an unfavorable investment climate and brought new investment in the mineral industry virtually to a halt. The foreign investment law of 1973, in effect in 1975, was restrictive and provided for extensive Government control. It permitted a 20% foreign ownership in certain sectors and established limits on profits and capital repatriation. Royalty and profit remittance could be made only via special external bonds, and foreign companies paid a special transfer tax of up to 40%. Price controls reduced profit levels, adversely affecting production and investment. A threat of nationalization to subsidiaries of three U.S. petroleum companies, among others, also had a dampening effect on further investment. The Central Bank restricted local credit to foreign companies. Money markets were erratic, and medium and long-term financing was difficult to obtain. Foreign companies were generally excluded from industrial promotion laws. A succession of tax rulings was unfavorable to foreign firms.

The best foreign investment opportunities were in joint ventures with public sector entities for the development of basic infrastructure, including the petrochemical and iron and steel industries. Late in the year, new regulations were

[1] Supervisory physical scientist, International Data and Analysis.

being promulgated to promote foreign investment in mineral development. Proposed incentives were the elimination or reduction of import duties on mining equipment, elimination of taxes on investments in exploration, and consideration of Provincial taxes when assessing Federal taxes. Foreign investment was considered important for mineral exploration under the Cordillerano Plan, the North Cordillera Plan, and the Patagonia Plan. A 3-year national reconstruction program would increase mineral technology development, prospecting, exploration, mine development, and mineral processing activities, including a network of processing plants to provide for domestic demand and for exportable surpluses. A regulatory decree interpreting a new mining law provided incentives for small- and medium-sized operations. The iron and steel, other ferrous, nonmetals, and fertilizer industries were granted first priority; construction minerals had second priority; regional mineral development had third priority; and mineral development for export had fourth priority.

The Mining Secretariat considered major investments in mining, quarrying, and processing equipment, including funds from the National Development Bank (Banco Nacional de Desarrollo—BND) and the private sector, and proceeded with the Comahue Plan for evaluating mineral resources of a 1-million-square-kilometer region in Patagonia. The first 2-year stage, scheduled for completion at yearend 1975, involved geological surveys in Río Negro, Chubut, and Neuquén Provinces.

The 1974–85 Energy Plan of the Energy Secretariat, Ministry of Economics, was designed to increase per capita energy consumption from 1,000 kilowatt-hours in 1974 to 3,000 kilowatt-hours in 1985, with principal emphasis on hydroelectric and coal development and de-emphasis of petroleum use in electricity generation. Proposed investments totaling $2,138 million were as follows: Oil and gas, $1,086 million; electricity generation, $987 million; coal, $49 million; and uranium, $16 million.[2] These programs were directed toward self-sufficiency in petroleum and nuclear fuels (uranium). They would reduce the share of the total energy supply derived from oil and gas from 85% in 1975 to 50% in 1985, and increase the share of electricity generation from hydroelectric sources to 48% in 1985. Continuing economic and political problems hindered long-term energy planning.

Early in the year, the Energy Secretariat announced a program to double electricity generation capacity by 1980. Agua y Energía Eléctrica and Electrobras of Brazil, both electrical utility companies, completed a joint study recommending three hydroelectric plants on the upper Uruguay River and priority to the middle Paraná River (Paraná Medio) projects. The program called for 26 hydroelectric, 7 thermal, and 3 nuclear plants underway or completed by 1980. Argentine electrical generating capacity would increase from 7,621 megawatts in 1975 to 15,085 megawatts in 1980.

Late in the year, a draft bill creating a National Electricity Company was presented for approval. This proposed new energy agency would take over the hydroelectric systems and the nuclear power development currently under the National Atomic Energy Commission (Comisión Nacional de Energía Atómica—CNEA).

[2] Unless otherwise specified, values have been converted from Argentine pesos (P) to U.S. dollars at the rate of P60.8=US$1.00, the exchange rate prevailing at yearend 1975.

PRODUCTION

Similar to factors affecting total industrial production, operations in the Argentine mineral industry were adversely influenced by reduced demand, financing difficulties, inflated costs, and labor problems. In the metals sector, production was fairly stable, although output of several metallic ores and crude metals was lower. In the nonmetals sector, most mineral commodities fared at least as well as in 1974, except for manufactured fertilizers, some of the construction materials, and sulfur. Among the mineral fuels, natural gas output continued to expand while crude oil output continued a downward trend. Coal production also was below that of 1974.

Values for individual minerals produced were either not available for 1975 or were difficult to estimate in U.S. dollar equivalents because of the numerous exchange rate revisions throughout the year. Based on limited available data, some of the mineral commodity values were as follows, in thousand dollars:

Commodity	*Value*
Metals:	
Refined gold	2,246
Lead concentrate	4,604
Manganese ore	21,207
Tin concentrate	1,013
Tungsten ore and concentrate	394
Zinc concentrate	5,775
Nonmetals:	
Clays	25,103
Sand and gravel	51,695
Stone, crude and worked	118,129
Other nonmetals	16,655
Mineral fuels:	
Coal	1,249

These commodities totaled slightly more than $248 million but did not include iron and steel, cement, fertilizers, oil and gas, and a few other minerals, which would add substantially to the total.

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

Commodity [1]	1973	1974	1975 [p]
METALS			
Antimony, mine output, metal content ... kilograms	1,200	4,500	1,500
Beryllium, beryl concentrate, gross weight	185	269	275
Chromium, chromite, gross weight	--	60	[e] 100
Columbium-tantalum, columbite-tantalite concentrate, gross weight ... kilograms	1,896	1,695	1,700
Copper:			
Mine output, metal content	284	315	183
Smelter [e]	80	[r] 80	80
Gold, mine output, metal content ... troy ounces	48	6,534	11,867
Iron and steel:			
Iron ore and concentrate, gross weight ... thousand tons	237	415	[e] 450
Pig iron ... do	804	1,070	1,040
Ferroalloys, electric furnace ... do	44	49	52
Crude steel ... do	2,205	2,354	2,203
Semimanufactures [2] ... do	3,185	3,123	2,134
Lead:			
Mine output, metal content	35,120	37,826	30,002
Smelter	32,200	35,000	39,600
Manganese ore and concentrate, gross weight	12,588	26,062	31,378
Silver, mine output, metal content ... thousand troy ounces	2,441	3,101	2,283
Tin, mine output, metal content	[r] 432	556	538
Tungsten, mine output, metal content	83	94	56
Uranium, mine output, U_3O_8 content ... kilograms	46,089	38,019	39,500
Zinc:			
Mine output, metal content	40,596	39,647	37,351
Smelter	33,300	37,200	39,600
NONMETALS			
Asbestos	620	896	1,123
Barite	28,765	36,241	39,000
Boron minerals, crude	63,380	77,989	78,000
Cement, hydraulic ... thousand tons	[r] 5,181	5,392	5,464
Chalk	41,710	52,750	55,200
Clays:			
Bentonite	101,648	113,322	116,000
Foundry earth	1,066	500	--
Fuller's earth (decolorizing clay)	357	216	236
Kaolin	99,205	93,237	94,500
Refractory	175,614	154,739	165,000
Other ... thousand tons	2,094	2,283	2,320
Diatomite	16,319	17,069	15,000
Feldspar	30,420	56,953	58,000
Fertilizer materials:			
Crude, natural phosphates (guano)	541	279	876
Manufactured: [3]			
Nitrogenous	NA	99,617	47,445
Phosphatic (Thomas slag)	NA	4,080	3,459
Ammonia, anhydrous [3]	NA	4,068	1,350
Fluorspar	45,968	40,672	38,000
Graphite	94	60	40
Gypsum, crude	454,382	510,872	515,000
Lithium, spodumene and amblygonite, gross weight	100	164	250

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
NONMETALS—Continued			
Mica:			
Sheet	435	426	430
Waste and scrap	2,505	2,771	2,900
Pigments, natural mineral, ocher	167	139	140
Pumice and related volcanic materials	34,423	65,892	68,000
Rhodochrosite	119	24	18
Salt:			
Rock ---thousand tons	2	1	1
Solar ---do	698	955	1,150
Total ---do	700	956	1,151
Sand and gravel:			
Sand:			
Construction ---do	10,580	12,777	12,850
Silica sand (glass sand) ---do	157	158	236
Gravel ---do	5,908	5,839	5,600
Stone:			
Dimension:			
Flagstone	79,234	74,634	75,000
Granite:			
Blocks	29,945	34,250	35,500
Other forms	11,200	9,200	NA
Marble and other calcareous, n.e.s	23,778	27,010	29,000
Sandstone ---thousand tons	249	80	80
Crushed, broken and unspecified:			
Basalt ---do	3,003	4,127	2,500
Calcite, nonoptical ---do	16	13	15
Dolomite ---do	218	208	180
Granite, crushed ---do	4,730	5,296	4,100
Limestone ---do	12,582	12,660	12,740
Marble, rubble ---do	89	95	NA
Quartz ---do	82	120	128
Quartzite ---do	1,237	1,718	1,730
Serpentine ---do	47	35	36
Shell marl ---do	761	645	NA
Strontium minerals, celestite	741	300	1,000
Sulfates natural:			
Aluminum (alum)	15,744	16,987	NA
Iron (melanterite)	60	25	NA
Magnesium (epsomite)	2,031	9,953	9,985
Sodium (mirabilite)	43,340	38,107	39,000
Sulfur, elemental, refined	59,669	47,297	29,897
Talc and related materials:			
Pyrophyllite	6,313	5,412	8,357
Steatite	5,961	460	400
Talc	38,227	34,698	35,000
Vermiculite	2,548	3,825	4,000
Zeolite	27	24	15
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	3,668	2,173	1,449
Carbon black [e]	30,000	[r] 30,000	30,000
Coal, bituminous ---thousand tons	453	626	502
Coke, all types, including breeze ---do	[r] [e] 610	650	[e] 610
Gas, natural:			
Gross production ---million cubic feet	314,793	332,839	362,860
Marketed ---do	[r] 237,631	255,748	271,639
Natural gas liquids:			
Natural gasoline ---thousand 42-gallon barrels	[r] 618	476	472
Butane ---do	4,002	1,525	1,687
Propane ---do		1,433	1,539
Total ---do	4,620	3,434	3,698
Peat, agricultural	10,419	10,132	[e] 10,000
Petroleum:			
Crude ---thousand 42-gallon barrels	[r] 153,539	151,110	144,364
Refinery products:			
Gasoline ---do	39,968	38,542	32,475
Jet fuel ---do	2,536	2,729	3,598
Kerosine ---do	5,689	6,449	6,104
Distillate fuel oil ---do	41,289	39,499	39,834
Residual fuel oil ---do	49,302	47,183	53,885
Lubricants ---do	1,726	1,778	1,784

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other:			
Liquefied petroleum gas ___thousand 42-gallon barrels__	10,109	10,425	7,057
Asphalt ______do____	3,215	2,804	2,615
Petroleum coke ______do____	2,329	2,610	4,179
Unspecified ______do____	--	--	507
Refinery fuel and losses ______do____	15,989	17,804	5,798
Total ______do____	172,152	169,823	157,836

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

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

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

[3] Data are for year ending June of that stated.

TRADE

The Economics Ministry changed trade regulations on several occasions in 1975. Commodity values, including products of the mineral industry, were negotiated on the financial or commercial market, each of which had different exchange rates.

For exports, a more flexible policy, adopted in July, required approval of export programs on a semiannual basis. In August, new restrictions, including taxes and a suspension of authorization to export, were adopted, affecting 750 commodities including mineral products. These restrictions were designed to regulate domestic prices and ensure domestic supply. The tax was 10% on most unprocessed minerals and 10% to 25% on the metals. In November, it was ruled that 75% of the f.o.b. value for certain export commodities must be marketed at the commercial rate and 25% at the normal financial rate. This list included chemicals, fuels, fertilizers, and iron and steel.

A decree of the Ministry in May, effective for the last half of the year, announced a new import regime, which required a declaration of import needs with prices not exceeding reference levels, and a yearend stock limitation not to exceed 10% of the allowed maximum for the year. New regulations, announced in June, further limited 1975 imports in order to save scarce foreign exchange, facilitate necessary imports to avoid supply disruptions, and increase prices to restrict import demand.

At yearend, values for all exports and imports were negotiated on the financial market. The commercial market was to be in operation only for liquidation of existing export-import contracts in effect up to November.

A large share of Argentina's mineral imports were metallic ores, concentrates, and crude metals. Mineral exports totaling $12.3 million ($17 million in 1974) were of minimal significance as a share of total exports ($2,989 million). According to the National Office of Mineral Economics, principal mineral export values in 1975 (values exceeding $100,000) were as follows, in thousand dollars:[3]

Borates, sodium and calcium, and products	4,940
Tin and silver concentrates	3,102
Salt	1,194
Bentonite	890
Granite, crude and worked	637
Gypsum	499
Marble, crude and worked	228
Fluorspar	224
Dolomite	150
Perlite	105

[3] Dirección Nacional de Economía Minera. Exportaciones de Minerales por País. Mineria, v. 13, No. 156, February 1976, pp. 15–18. Values reported in U.S. dollars; exchange rate not reported.

Table 2.—Argentina: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Oxide (alumina) and hydroxide	1	4
Metal including alloys, all forms	1,618	2,474
Antimony ore and concentrate	--	2
Beryllium, beryl ore and concentrate	100	75
Cadmium metal including alloys, all forms	6	--
Chromium oxide and hydroxide ......kilograms	r 500	5,081
Copper metal including alloys, all forms	1,174	944
Iron and steel:		
Pig iron and similar materials	129	1
Ferroalloys	--	30
Steel, primary forms	r 42,664	6,223
Semimanufactures:		
Bars, rods, angles, shapes, sections	366,474	223,233
Universals, plates, sheets	99,617	46,845
Hoop and strip	1,339	1,741
Rails and accessories	587	405
Wire	17,417	19,824
Tubes, pipes, and fittings	19,043	43,809
Castings and forgings, rough	231	1,146
Lead:		
Oxide	r 1	(1)
Metal including alloys, all forms	r 18	2
Magnesium metal including alloys, all forms	r 23	16
Manganese oxides	2	--
Mercury ......76-pound flasks	--	(1)
Molybdenum metal including alloys, all forms ......kilograms	4	89
Silver metal ......thousand troy ounces	r 486	6
Tin:		
Ore and concentrate	2,757	3,788
Metal including alloys, all forms	r 48	46
Tungsten:		
Ore and concentrate	66	22
Metal including alloys, all forms ......kilograms	r 3	7
Uranium and thorium:		
Oxides, including rare-earth oxides ......do	303	202
Metals including alloys, all forms ......do	--	800
Zinc:		
Oxides	409	230
Metal including alloys, all forms	157	470
Other:		
Ash and residue containing nonferrous metals	670	479
Oxides, hydroxides and peroxides of metals, n.e.s	25	26
Base metals including alloys, all forms, n.e.s ......kilograms	116	--
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc ......do	3,937	7
Grinding and polishing wheels and stones ......do	18,766	47,481
Asbestos	1	(1)
Barite	--	864
Boron materials:		
Crude natural borates	5,857	7,360
Oxide and acid	219	1,026
Borates and perborates	12,485	14,099
Cement	8,473	8,724
Chalk	5	76
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s.:		
Bentonite	14,116	16,521
Kaolin	77	117
Other	124	298
Products:		
Refractory (including nonclay bricks and cement)	190	859
Nonrefractory	1,077	1,096
Diatomite and other infusorial earth	32	74
Feldspar	20	(1)
Fertilizer materials:		
Crude, nitrogenous	18	--
Manufactured:		
Nitrogenous	4	6
Phosphatic, Thomas slag	30	--
Mixed	410	358
Ammonia	544	510
Fluorspar	7,100	995
Gypsum and plasters	11,217	16,809

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Lime	36	163
Magnesite	--	1
Lithium and lithium compounds	10	40
Mica:		
Crude, including splittings and waste	2,552	1,332
Worked, including agglomerated splittings kilograms	27	143
Pigments, mineral:		
Natural, crude	3	5
Iron oxides, processed	544	1,020
Precious and semiprecious stones, except diamond, natural kilograms	--	347
Salt	79,415	82,583
Sodium and potassium compounds, n.e.s kilograms	471	45
Stone, sand and gravel:		
Dimension stone:		
Crude	16,075	14,689
Worked	1,591	866
Dolomite	840	2,134
Gravel and crushed rock	8,634	57,783
Quartz	20	5
Sand	1,753	18,988
Ornamental:		
Onyx	1	(1)
Rhodochrosite	89	51
Sulfur:		
Elemental	3	--
Sulfur dioxide	--	6
Sulfuric acid	219	324
Talc, steatite, soapstone, and pyrophyllite	388	670
Other nonmetals, n.e.s.:		
Crude	340	57
Slag, dross and similar waste, not metal bearing	523	681
Bromine, iodine and fluorine	r 4	6
Oxides, hydroxides and peroxides of strontium, barium, magnesium	74	30
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	89	76
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	488	633
Carbon black	8,822	8,536
Coal, all grades	3,023	3,011
Coke and semicoke	--	27
Rare gases, argon and other kilograms	r 3,841	7,500
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	18	151
Kerosine do	(1)	--
Distillate fuel oil do	97	--
Residual fuel oil do	(1)	103
Lubricants do	104	55
Other:		
Liquefied petroleum gas do	--	8
Mineral jelly and wax do	51	23
Bitumen and other residues do	44	48
Bituminous mixtures, n.e.s do	19	23
Petroleum coke do	172	117
Unspecified do	(1)	(1)
Total do	505	528
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	17	23

r Revised.
1 Less than ½ unit.

Table 3.—Argentina: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Bauxite and concentrate	17,252	38,673
Oxide (alumina) and hydroxide	9,903	13,305
Metal including alloys, all forms	77,256	86,514
Antimony:		
Ore and concentrate	319	323
Metal including alloys, all forms kilograms	4,102	278

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

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS—Continued		
Arsenic:		
Trioxide and acids	526	438
Metal including alloys, all forms	16	9
Bismuth:		
Ore and concentrate	--	3
Metal including alloys, all forms	24	20
Cadmium metal including alloys, all forms ----kilograms	r 588	103
Chromium:		
Chromite	r 3,745	5,250
Oxide and hydroxide	7	11
Metal including alloys, all forms	7	2
Cobalt:		
Oxide and hydroxide	3	12
Metal including alloys, all forms	108	128
Columbium and tantalum, tantalum metal including alloys, all forms ----kilograms	19	29
Copper:		
Ore and concentrate	1,595	3,086
Metal including alloys, all forms	37,243	46,174
Gold metal, unworked or partly worked, all forms ----troy ounces	2,701	11,478
Iron and steel:		
Ore and concentrate ----thousand tons	1,235	1,003
Metal:		
Scrap ----do	234	148
Pig iron, including spiegeleisen ----do	110	147
Sponge iron, powder and shot	1,582	2,366
Ferroalloys	6,889	9,643
Ingots and other primary forms ----thousand tons	r 1,598	1,153
Semimanufactures:		
Common steel:		
Bars and rods ----do	r 9	5
Angles, shapes and sections ----do	20	17
Universals, plates and sheets ----do	238	256
Hoop and strip ----do	5	3
Rails and accessories	753	289
Wire	111	133
Tubes, pipes and fittings ----thousand tons	7	14
Castings and forgings	239	285
High carbon and alloy steel, all forms ----thousand tons	35	45
Lead:		
Ore and concentrate	30	2,268
Oxides	7	132
Metal including alloys, all forms	681	1,763
Magnesium metal including alloys, all forms	451	462
Manganese:		
Ore and concentrates	55,919	98,673
Oxides	458	1,362
Metal	61	43
Mercury ----76-pound flasks	560	1,716
Molybdenum:		
Ore and concentrates	44	40
Metal including alloys, all forms	r 9	14
Nickel metal including alloys, all forms	r 984	1,252
Platinum-group metals and silver:		
Platinum group ----troy ounces	2,283	234,989
Silver ----thousand troy ounces	158	1,422
Rare-earth metals and compounds	r 54	62
Selenium, elemental	10	14
Tellurium ----kilograms	100	198
Tin metal including alloys, all forms	r 1,537	2,018
Titanium:		
Ore and concentrate	1,815	2,433
Oxides	1,326	1,241
Metal including alloys, all forms	16	13
Tungsten metal including alloys, all forms	7	7
Zinc:		
Ore and concentrate	1,105	24,217
Oxides	75	36
Metal including alloys, all forms	3,919	1,447
Zirconium ore and concentrate	192	20
Other:		
Ore and concentrate	1,024	1,219
Oxides, hydroxides and peroxides of metals, n.e.s	382	504
Metals including alloys, all forms:		
Metalloids	3,988	4,341
Pyrophoric alloys ----kilograms	348	581
Base metals including alloys, all forms, n.e.s ----do	r 3,135	1,296

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	245	364
Dust and powder of precious and semiprecious stones	4	8
Grinding and polishing wheels and stones	82	111
Asbestos	13,484	17,831
Barite and witherite	86	3,566
Boron materials:		
Borates and perborates	165	114
Boric acid	6	3
Bromine	46	100
Cement	3,263	11,491
Chalk	211	308
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s.:		
Bentonite	5	4
Fire clay	96	190
Kaolin	15,513	17,312
Andalusite, kyanite and sillimanite	555	507
Other	613	2,656
Products:		
Refractory (including nonclay bricks)	r 21,357	26,767
Nonrefractory	1,445	1,794
Cryolite and chiolite	9	10
Diamond:		
Industrial value, thousands	$352	$717
Powder thousand carats	180	211
Diatomite and other infusorial earth	1,651	4,353
Feldspar and fluorspar	2,619	905
Fertilizer materials:		
Crude:		
Nitrogenous	11,652	23,417
Phosphatic	--	11,400
Manufactured:		
Nitrogenous	11,661	13,473
Phosphatic	41,049	38,570
Potassic	20,466	15,747
Mixed	39,600	33,032
Ammonia	r 3	2
Graphite, natural	345	705
Iodine	65	124
Magnesite	18,068	22,290
Mica:		
Crude, including splittings and waste	28	20
Worked, including agglomerated splittings	14	15
Pigments, mineral:		
Natural, crude	15	1
Iron oxides, processed	193	215
Precious and semiprecious stones, except diamond thousand carats	r 29,440	3,875
Pyrite (gross weight)	31	55
Salt and brines	14	10
Sodium and potassium compounds, n.e.s.:		
Caustic soda	44,778	92,780
Caustic potash, sodic and potassic peroxides	545	1,113
Sodium carbonate, natural and manufactured (soda ash)	150,251	166,866
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	2,534	2,092
Worked	29	10
Dolomite, chiefly refractory grade	3,964	5,714
Gravel and crushed rock, n.e.s	3,187	17,270
Quartz and quartzite	284	352
Sand, excluding metal bearing thousand tons	68	72
Sulfur:		
Elemental:		
Other than colloidal	71,545	78,497
Colloidal	67	83
Sulfuric acid	19	41
Talc, steatite, soapstone, and pyrophyllite	257	521
Other nonmetals, n.e.s.:		
Crude	565	888
Slag, dross and similar waste, not metal bearing, from iron and steel manufacture	r 373	30
Oxides, hydroxides and peroxides of strontium, barium, magnesium	108	544
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	1	9

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	71	109
Carbon black	1,036	1,019
Coal, all grades, including briquets thousand tons	782	822
Coke and semicoke do	4	5
Hydrogen and rare gases kilograms	1,341	325
Peat	80	272
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	r 17,602	24,058
Refinery products:		
Gasoline do	531	602
Kerosine do	226	34
Distillate fuel oil do	585	1,094
Residual fuel oil do	2,937	945
Lubricants do	r 23	18
Other:		
Liquefied petroleum gas do	13,761	22,796
Nonlubricating oils, n.e.s do	21	1
Other do	r 57	39
Total do	18,141	25,529
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	75,642	82,933

r Revised.

COMMODITY REVIEW

METALS

Aluminum.—The aluminum smelter of Aluminios Argentinos S.A. (ALUAR) at Puerto Madryn, Chubut Province, was operating at rated initial annual capacity of 35,000 tons early in the year. Plans were made for expansion to 140,000 tons per year eventually. Bauxite was imported from Australia. The new plant was expected to ease demand for imported aluminum products.

Deposits of alunite near Camarones and Alto Rio Senguerr, both in Chubut Province, were considered as possible future sources of raw material for the Puerto Madryn smelter. A large-scale survey, including a feasibility study for a commercial-scale mining operation, was planned.

Copper.—Compañía Minera Aguilar S.A. (CMA), a subsidiary of St. Joe Minerals Corp., proceeded with development plans for the Pachon ore body in southwestern San Juan Province. The deposit, at elevations of 3,600 to 3,900 meters in the Andes near the Chilean border, was discovered in the 1960's. The company envisioned a $1-billion, 100,000-ton-per-year, mine-smelter-refinery complex. CMA planned to invite U.S., European, and Japanese companies to bid on construction contracts. Ore reserves were estimated at 792 million tons averaging 0.59% to 0.62% copper, including 160 million tons with 1% copper, considered sufficient for 35 years at annual production rates of 70,000 to 100,000 tons of copper. Mine development would be by open pit with a 140-kilometer ore slurry pipeline to the smelter-refinery, which would be located 20 kilometers southwest of Barreol. A feasibility study was undertaken, but further planning was tentative pending financial arrangements and negotiations with the Argentinian Government.[4] With copper consumption estimated at 50,000 tons per year, most of which was imported, Pachon development would eliminate the copper supply deficit and provide copper for export sales.

The Mining Secretariat provided funds to the Dirección General de Fabricaciones Militares (DGFM), the main Government body engaged in strategic mineral development, for 5,000 meters of drilling on copper properties of Yacimiento Mineras de Agua de Dionisio (YMAD), the State mining agency, in the Department of Belen, Catamarca Province. YMAD estimated ore reserves at La Alambrera, Hualfin District, at 200 million tons containing an average of 0.5% copper and traces of gold. The operation appeared marginal at yearend.

[4] Engineering and Mining Journal. Two Mines Give St. Joe Latin American Base. V. 177, No. 11, November 1976, pp. 122–123.

A recent discovery in the Mercenario area, San Juan Province, was expected to add to growing copper reserves.

Iron Ore.—Resource studies, mine expansion, and new mine development continued under the ongoing National Iron and Steel Plan. Development work at Sierra Grande, Rio Negro Province, was approximately 60% completed at yearend. A 6-week strike late in the year resulted in damage to camp facilities and flooding of underground workings. The project, formerly scheduled for completion in 1976, was about 2 years behind schedule, mainly because of delays in financing and equipment delivery. The mine, preconcentration, and pelletizing plants were near completion. A 35-kilometer slurry pipeline to the pelletizing plant at the port was under construction. Development cost was estimated at $287 million for an ore capacity of 2.5 million tons per year. Mining was underway at the South ore body, which was 2.5 kilometers long and 15 meters thick. Total reserves of magnetitic ore, averaging 55% iron, were 265 million tons, and potential for additional reserves was considered good. Pellets of 69% iron were to be shipped to the State-owned steelworks of Sociedad Mixta Siderúrgica Argentina (SOMISA).

A 40% interest in the Sierra Grande project was held by Hierro Patagónica Sociedad Anónima Minerva (HIPASAM), which started the project in 1970 and which was controlled (85%) by the DGFM. Other shares were held by the Provincial Government, internal creditors, the Inter-American Development Bank (IDB), and other international organizations.

The Mining and Geology Board, Misiones Province, was considering reopening of inactive iron ore mines, development of new mines, and exploration in the Province. The Iron and Steel Institute also studied possible development of iron ore deposits in Misiones Province and in Mendoza Province.

Total iron ore reserves in nine Provinces were estimated at more than 1 billion tons containing 467 million tons of iron.[5] The Sierra Grande ore body was the largest in terms of total contained iron.

[5] Brarda, S. Expansión de la Ferrominería Argentina. Mineria, v. 13, No. 150, August 1975, p. 11.

Table 4.—Argentina: Iron ore resources, by deposit, in 1975

(Quantities in million tons)

Province	Deposit	Resources					
		Measured reserves	Indicated reserves	Inferred reserves	Potential	Average grade (percent iron)	Iron content
Buenos Aires	Sands of Bahia San Blas and littoral Atlantic	21	--	--	550	5	28.5
Catamarca	Visvil, Carmen mine, Cortadera	--	--	--	.5	31.5	.2
Jujuy	Santa Barbara	--	374	72	(1)	30.9	137.6
Do	Zapla, Puesto Viejo, Labrador	19	50	23	(1)	41.5	38.2
Do	Pantanillo, Hondura	--	--	--	4	36	1.5
Do	Capillas River, Colorado River	--	--	--	10	33	3.3
Do	Abra, Tabacal, Yoruma	--	--	--	4	40	1.6
Mendoza	Indio	.3	--	--	--	63	.2
Misiones	Misionera Basin	23	--	--	(1)	30.6	7.0
Neuquén	Maullin, Collipulli Lake	--	--	--	2	50	1.0
Rio Negro	Sierra Grande	90	45	130	(1)	55	145.7
Salta	Unchime	14	151	105	(1)	35.7	96.4
Do	Sarita	--	--	--	5	45	2.2
San Juan	Leoncito, Leonardo	3	6	--	--	47	4.2
Total		170.3	626	330	(1)	XX	467.6

XX Not applicable.

[1] Not estimated but considered significant.

Iron and Steel.—Pig iron and crude steel production were lower, compared with that of 1974, owing to labor problems, renewed price controls, and the continuing economic crisis, which affected demand for steel products and investment in the industry. Crude steel output comprised ingots (74%) and continuous casting products (26%). Production was reported by 13 companies, the leader of which was SOMISA, which accounted for approximately one-half of the total output. On the basis of annual steelmaking capacity of 4.5 million tons, production was at about half-capacity during the year. Since 1966, demand for steel had increased 12%, and production increased only 6%, necessitating higher imports.

The 3-Year Development Plan of the National Iron and Steel Plan, directed by DGFM, involved continuing modernization and expansion throughout the industry. According to the Iron and Steel Industry Center (El Centro de Industrielles Siderúrgicos—CIS), the development program involved 10 operating companies. A new integrated steel project, Siderúrgica Integrada Sociedad Anónima Industrial y Comercial (SIDINSA), was initiated by decree in May. The plan called for expansion of annual crude steel capacity to 18 million tons by 1985, considered sufficient to meet projected demand for that year and provide an exportable surplus. Consumption in 1985 was projected to be 12 million to 13 million tons.[6]

The most significant development activities were by the leading producers—SOMISA, Acindar S.A. (the leading private iron and steel company), and Dálmine Siderca S.A.I.C. SOMISA planned expenditures of $225 million in domestic markets and $5 million on purchases from foreign sources during 1975–79. The DGFM called for bids on basic design and engineering for expansion from the current capacity of 2.5 million tons of crude steel per year to 4 million tons. A Dálmine direct reduction plant, employing the Midrex process, was scheduled for operation late in 1976. Designed capacity was 330,000 tons of sponge iron per year, based on pellet or iron ore feed. New steelmaking and rolling capacity was also under development by Dálmine.

In January, a Government decree authorized Acindar to proceed with financial arrangements for major new facilities, including integrated direct reduction, continuous billet casting, and new steelmaking and milling capacity. In February, the Economics Ministry agreed to a Midrex direct reduction plant for 462,000 tons of sponge iron (93% iron) per year from pellet feed, three 80- to 90-ton electric furnaces, and six billet lines for 600,000 tons per year. This billet capacity was scheduled for completion in 1979; a 400,000-ton capacity would be readied in 1978. The plant site was at Villa Constitución, Santa Fe Province. New facilities were also to include rolled products, wire, pipe, tubes, and forged products. Financial arrangements involved the Argentine Government, the IDB, the U.S. Export-Import Bank, New York banking interests, and the BND for local financing.[7]

Planning for the SIDINSA integrated steelworks project was given high priority by the DGFM and BND. The proposed project included sintering (5 million tons per year), coke (1.8 million tons per year), three calcining furnaces (300 tons each), two blast furnaces (3.7 million tons of pig iron per year), three oxygen converters (3.8 million tons of steel per year), continuous casting (700,000 tons per year), plate (3 million tons per year), coils (3.2 million tons per year), and electrolytic tinning lines. Completion would be in 1982, and eventual expansion to 8 million tons of steel per year was included in the program. The proposed investment plan was for $2,677 million[8] during 1975–80.

Lead, Zinc, Silver.—CMA produced 74,734 tons of zinc concentrate and 37,515 tons of lead concentrate containing 1,600,561 troy ounces of silver at its mine situated at an elevation of 4,400 meters in the Andean Altiplano, Jujuy Province, in extreme northwestern Argentina. These concentrates were shipped to Argentina zinc smelters in which CMA held interests —the 18,000-ton-per-year electrothermic smelter of Compañía Metalúrgica Austral Argentina S.A.C.I.F. and the 24,000-ton-

[6] Centro de Industriales Siderúrgicos. La Siderurgia Argentina 1974–75, published in 1976, pp. 105–119.

[7] El Instituto Argentino de Siderurgia. Proyecto de Integración: Acindar S.A. Siderurgia, v. 2, No. 6, October–December 1975, pp. 8–13.

[8] Converted from 26,720 million pesos at the exchange rate of P9.98=US$1.00, the rate prevailing in May 1975.

per-year electrolytic plant of Sulfacid S.A.I.F.C., which also produces 70,000 tons of sulfuric acid per year.

The CMA ore body is complex, and ore reserves were difficult to establish. Reserves at yearend were considered sufficient for 10 years at 1975 production rates. Mine development included 15 levels, 7 adits, and 2 underground shafts. Mill heads averaged 6.2% lead (86% recovery), 7.7% zinc (88% recovery), and 4.5 troy ounces of silver per ton. Mill capacity was 2,100 tons of ore per day.[9]

Table 5.—Argentina: Iron and steel plants operating in 1975 [1]

Province	Company	Plant location	Approximate crude steel production, 1974 (thousand tons)
Buenos Aires	Sociedad Mixta Siderúrgica Argentina (SOMISA)	San Nicolas de los Arroyos	1,160
Do	Propulsora Siderúgica S.A.	Ensenada	[1] 442
Do	Dálmine Siderca S.A.	Campana	248
Do	Establecimiento Metalúrgicos Santa Rosa S.A.	La Tablada	178
Do	Gurmendi S.A.	Avellaneda	145
Do	S.A. Talleres Metalúrgicos San Martín (TAMET)	Riachuelo	82
Do	La Cantabrica S.A.	Haedo	67
Do	Aceros Bragada S.A.	Bragado	57
Do	Aceros Ohler S.A.	Valentin Alsina	52
Do	Maitini y Sinai S.A.	Munro	1
Jujuy	Establecimiento Altos Hornos Zapla	San Salvador	115
Santa Fe	Acindar S.A.	Rosario, Villa Constitución	235
Do	Cura HNOS S.A.	Rosario	21
Total			2,361

[1] Cold-rolled sheet from imported coils; not included in total.
Source: Centro de Industriales Siderúrgicos.

Table 6.—Argentina: Iron and steel capacity, by type, in 1975 [1]

Product	Capacity (thousand tons per year)
Pig iron	2,362
Steel:	
Siemans Martin	1,561
Electric	1,212
Oxygen converter	1,660
Thomas converter	95
Total	4,528
Mill products:	
Hot-rolled:	
Nonplate	2,007
Plate	1,300
Pipes and tubes	150
Total	3,457
Cold-rolled: Plate	1,125
Tinplate	110

[1] As of Jan. 1, 1975.
Source: Centro de Industriales Siderúrgicos.

Manganese.—Manganese ore and concentrate production increased sharply as new mine development continued. The bulk of the output was from mines in Santiago del Estero, Cordoba, and Mendoza Provinces.

Investigations were underway near the Seghesso rail branch line, northeast of the Ojo de Agua deposit in Santiago del Estero Province, and at Pozo Nuevo, Department of Sobremente, Cordoba Province. Ore treatment plants in these two Provinces had total capacity of 24,000 tons of manganese concentrate per year.

YMAD's Farallon Negro deposit, Catamarca Province, was planned for development by both open pit and underground mining methods. An annual initial produc-

[9] Pages 121–122 of work cited in footnote 4.

tion rate of 25,000 tons of 40% manganese ore, 80,000 troy ounces of gold and 19,000 troy ounces of silver, was envisioned.

Other Metals.—The Mining Secretariat provided funds for a tungsten concentrating plant at La Toma, San Luis Province. Construction was in progress at yearend. Planned annual capacity was 460 tons of tungsten in concentrate.

Under a CNEA program, a foundry for zirconium alloy (zircalloy) fabrication was to be built. CNEA sought a supply of zirconium sponge and semifabricated products.

NONMETALS

Cement.—Cement production was slightly below that of 1974, mainly because of reduced construction activity in the public and private sectors. Output was only 63% of annual capacity. As of January 1975, salient statistics were as follows:

Number of operating companies	16
Total installed annual capacity thousand tons	8,600
Shipments of portland cement in 1974 do	5,410
Consumption of portland cement in 1974 do	5,405
Per capita consumption in 1974 kilograms	219
Number of workers in industry	8,017

Clays.—*Kaolin.*—The processing plant of Caolines Argentinos S.A. near Dique Florentino Ameghino, Chubut Province, had daily capacity of 150 to 180 tons of crude kaolin, 48 tons prepared for the paper industry, and 24 tons with high aluminum content for use in special cements and fine ceramics.

Construction Materials.—Demand for sand, gravel, and crushed stone was lower than that of 1974 because of reductions in major public works programs. Output is expected to increase as the 3-year economic plan progresses.

Sodium Compounds.—In December, the Government ratified the decision to build Argentina's first sodium carbonate (soda ash) plant, employing the Solvay process, at San Antonio Oeste, Rio Negro Province. Alcali de la Patagonia S.A. was to be the operating company. The plant site was near large salt deposits with reserves totaling more than 400 million tons. Scheduled capacity was 200,000 tons of soda ash or other sodium products per year. Markets would be in the glass industry 60%, chemicals 10%, and miscellaneous (textiles, iron and steel, soap, china, etc.) 30%.

Total capital investment was estimated at $40 million, provided by the Government, which held a 51% interest, and by CIDASA S.A. and Ferrostaal AG, West Germany, which together held a 49% interest. Ferrostaal was to provide technical assistance and was awarded a turn-key construction contract. Completion was scheduled for late 1977.

The plant was expected to cover current domestic demand for soda ash, but additional capacity would be needed in the near future to meet growing demand.

Seven companies produced sodium hydroxide (caustic soda) by the mercury or the diaphragm process. Expansions were planned by some of the producers. Demand increased 55% since 1970 to 175,000 tons in 1974 whereas annual capacity increased only 32% to 128,000 tons during the 4-year period.

Other Nonmetals.—Federal and Provincial authorities and private interests signed agreements to re-evaluate fluorspar deposits in Chubut Province as possible sources for the aluminum industry and conduct a feasibility study for the mining and concentrating of barite from deposits also in Chubut Province.

The new iron ore mine at Sierra Grande, Rio Negro Province, scheduled for operation late in 1976, will also produce byproduct phosphates for the fertilizer industry at a rate of 170,000 tons per year.

Development plans for CMA's El Pachon copper ore body in San Juan Province included recovery of as much as 300,000 tons of byproduct sulfur per year from the copper sulfide ores.

MINERAL FUELS

Coal.—Production by Yacimientos Carboníferos Fiscales (YCF) at Rio Turbio, Santa Cruz Province, was substantially lower than that of 1974, owing to slack industrial demand during a difficult economic period. The domestic price increased 70% to an average of about $100 per ton during the year. Imports included coking coal for blending with noncoking

Rio Turbio coals for use in the iron and steel industry. Other principal uses were in thermal powerplants, railroads, and domestic heating in Santa Cruz Province.

The National Iron and Steel Plan included coal resource assessment, mine modernization and expansion, and new mine development.[10] Reserves at Rio Turbio were estimated at 450 million tons. Exploration for coal was underway at Rio Coyle and Manto Dorotea in the Rio Turbio area, and YCF planned to investigate areas of coal potential in Cordoba, La Rioja, San Juan, Mendoza, Neuquen and Rio Negro Province. Production capacity was to be expanded at Mine 3 at Rio Turbio, and a new Mine 5 was to be developed. The schedule called for total coal production of 3 million tons by 1980 and possibly 5 million tons at a later date. Demand was projected at 4 million tons in 1977 and 7.5 million tons in 1980.

Other new projects under the program were a 1,000-ton-per-hour (3 million tons per year) washing plant, transportation facilities, and expansion of the Gallegos River port to a capacity of 1.2 million tons per year.

Natural gas.—Gross and marketed production continued to expand in 1975. Yacimiento Petrolíferos Fiscales (YPF), the State petroleum company, accounted for 78% of gross output, YPF contractors for 21%, and other companies, 1%. A total of 52.5 billion cubic feet was imported from Bolivia through the Compo-Duran-Buenos Aires pipeline, compared with 51.9 billion cubic feet in 1974, at a cost of $43 million, which was 45% higher than the 1974 price. Argentina and Bolivia reached an agreement on doubling imports by 1979. Total natural gas sales in Argentina were 276 billion cubic feet in 1975. Natural gas provided about 23% of the total energy supply.

Gas del Estado, the Government-owned gas company, planned to double production at the San Sebastian gasfield on Tierra del Fuego with a new gas processing plant and a 200-kilometer pipeline to the mainland, near the entrance to the Straits of Magellan, including a 45-kilometer marine section. Capacity at the processing plant was 106 million cubic feet per day. The new line was to connect with the main line to Buenos Aires and have capacity for 120 million cubic feet per day, with construction to start in 1976. IDB financing, with imported technology and equipment, was sought.

Nuclear Energy.—The CNEA reported proven uranium reserves at 23,785 tons U_3O_8 and potential resources (recoverable at cost equivalent to $45 per pound U_3O_8) at 295,000 tons U_3O_8. The CNEA continued development of the uranium deposit at Sierra Pintada, Mendoza Province, for a mining rate of 600 tons U_3O_8 per year. Reserves were 11 million tons of ore at 0.11% U_3O_8, or about 12,000 tons U_3O_8. A contract was signed with Simons-Inconas Co. for construction of the mining complex. The Sierra Pintada deposit was expected to supply uranium for nuclear fuel needs sufficient for 15 years.

The 319-megawatt Atucha 1 nuclear powerplant, Buenos Aires Province, was shut down for a period during the year. The 600-megawatt Rio Tercero plant, under construction in Cordoba Province, was less than 10% completed at yearend and was held up pending completion of contract negotiations. Planning for an Atucha 2 unit was halted because of a shortage of funds. The CNEA was also planning for heavy water and other nuclear fuel cycle facilities.

Petroleum.— *Crude oil.*—Production continued the decline following peak output of 1972. This decline was attributable to insufficient exploration, price controls which tended to depress exploration, and the need for improved secondary recovery methods. Average output per well was 73.6 barrels per day (85.5 barrels per day in 1972). YPF accounted for 72.6% (105 million barrels) of the 1975 output, followed by YPF contractors 26.7%, and other producers 0.7%. Among the YPF contractors, the leading producers were Amoco Argentina Oil Co. (17.9 million barrels), Argentina Cities Service Co. (16.7 million barrels), and Perez Company (7.5 million barrels). The most productive districts were the Golfo San Jorge Basin, Chubut and Santa Cruz Provinces, which accounted for 36% of total 1975 output, and the Andean Basin, Mendoza Province, with 25% of total output for the year.

The Energy Secretariat embarked on a program to find more oil and increase pro-

[10] Mineria. Plan de Expansión de YCF (1975–1980), Información Proporcionada por YCF. V. 13, No. 149, July 1975, pp. 45–46.

duction. Calls for bids were to be issued for exploration and improved secondary recovery methods at existing fields onshore and offshore in Tierra del Fuego and offshore from Bahia Blanca, Buenos Aires Province, where seismographic studies indicated good potential.

Development drilling at YPF's Puesto Rojas Field in Mendoza Province, discovered in 1974, resulted in an average of 5,032 barrels per well in 1975.

A total of 547 wells were drilled (313 by YPF and 234 under private contract with YPF), of which 373 were considered capable of oil or gas production. This was 59 wells less than the total for 1974. YPF reported proven reserves of 2,466 million barrels, all onshore, including 1,333 million barrels recoverable by primary methods and 1,133 million barrels recoverable by secondary methods.

YPF concluded detailed seismic work, started in 1974, on the potential of the Continental Shelf. Three basins (Salado, Colorado, and Marina Austral) of seven basins identified as favorable for petroleum resources were explored. The latter basin, offshore from Santa Cruz Province and Tierra del Fuego, was considered particularly favorable—a gentle dip to the shelf, thick sediments, and geology similar to adjacent productive onshore deposits. A semisubmersible platform, acquired in France, was scheduled for arrival in Argentina in 1976.[11]

Imports of crude oil in 1975, totaling 15.7 million barrels, were from Libya (66.6%), Bolivia (29.0%), Peru (1.8%), Venezuela (1.7%), and Saudi Arabia (0.9%), according to the National Statistical and Census Institute (Instituto Nacional de Estadística y Censos). These imports, valued at $219 million, were 27% below the 1974 level.

Refinery Products.—Refinery throughput of crude oil in 1975 was 158 million barrels, 7% below that of 1974. A total of 142 million barrels was of domestic origin and 16 million barrels was of foreign origin. With total refinery capacity of 230 million barrels per year, refinery operations were at 69% of capacity in 1975. Sales were down from 1974 owing to the economic recession and restrictions on driving in Buenos Aires. Demand for all petroleum refinery products was about 170 million barrels, 90% of which was produced in Argentina and 10% was imported.

Petroleum products accounted for 62% of the total energy supply in 1975, although efforts were made to de-emphasize the use of petroleum and develop alternate energy sources. Price increases were sought to improve profitability and provide incentives for exploration.

[11] Oil and Gas Journal. Argentina Backtracks Early Shelf Study, Likes Results of New Geophysical Surveys. V. 73, No. 14, Apr. 7, 1975, p. 165.

Table 7.—Argentina: Petroleum product trade, by type, in 1975

(Thousand barrels)

Product	Exports	Imports
Motor gasoline	--	754
Aviation gasoline	2	89
Kerosine	--	380
Distillate fuel oil	8	3,475
Residual fuel oil	240	--
Liquefied petroleum gas	61	4,852
Lubricants	49	248
Residual carbon	1,309	--
Other	48	--

Source: Secretaría de Estado de Energía.

Table 8.—Argentina: Principal petroleum product sales, by type

(Thousand barrels)

Product	1974	1975
Motor gasoline	38,713	32,584
Aviation gasoline	228	179
Kerosine	6,511	6,319
Jet fuel	3,024	3,100
Distillate fuel oil	41,233	41,037
Residual fuel oil	47,694	44,733
Liquid petroleum gas	10,332	10,318
Lubricants	1,778	1,413
Asphalt	2,864	2,433

Source: Secretaría de Estado de Energía.

The Mineral Industry of Australia

By Charlie Wyche [1]

In 1975, Australia experienced a reduced rate of expansion in mine production of most minerals, and in some cases output actually declined. The general recession which began in 1974 and continued throughout 1975 made its impact felt on world mineral commodity demands and subsequently on many Australian mining companies. Nevertheless, new records were set in both production and export of many major minerals. Those minerals showing the greatest improvement were nickel and phosphate rock, as a result of new mining operations, and tungsten, because of increased output at existing mines. However, mine production of copper and tin declined, as did exports of alumina, iron ore and pellets, lead, zinc, and mineral sands. Arising largely from renegotiation of contracts to cover escalation of costs and from the beneficial effect on export revenues of devaluation of the Australian dollar late in 1974, increased average values helped to produce another record income from mineral exports.

The value of mine and quarry production was also a record $3.4 billion,[2] an increase of nearly 17% compared with the $2.9 billion reported for 1974. The value added by domestic smelting and other processing of mineral commodities credited the mineral industry with approximately $4.7 billion. Minerals produced and initially processed during 1975 represented 6% of the estimated $80 billion adjusted gross national product (GNP).

Western Australia strengthened its position as the country's largest mineral-producing State, accounting for 24% of the total national mineral output value in 1975. The value of mineral output in Western Australia (dominated by iron, bauxite, nickel, and gold) reached about $820 million in 1975, compared with $780 million in 1974. The large-scale development of iron ore resources became a major factor in the economic and industrial progress of the State. The six companies operating in Western Australia in 1975 produced 87 million tons of iron ore, representing about 90% of the total Australian production of 97 million tons. Eleven other companies signed development agreements with the State Government.

Queensland replaced New South Wales as the second largest mineral-producing State. The value of Queensland's minerals output in 1975 was a record $725 million, accounting for 21% of the total national output. This was $30 million higher than in 1974. Coal and copper, which earned about $250 million and $210 million, respectively, were the largest contributors. New South Wales' output of silver, lead, zinc, copper, and coal ranked the State as the third largest mineral producer with 20% of the national total. Victoria, the only brown coal producing State, was in fourth place with 18%. South Australia, Tasmania, and the Northern Territory, with production of such commodities as iron ore, bauxite, tin, and copper, accounted for the remainder.

The Federal Government announced a new policy on foreign investment in Australia during 1975. While the policy had much in common with that of the previous Government (defeated in December 1974), it was much more flexible. Except for the ruling on uranium projects, the guidelines provided for discussion of the interest of local participation on an individual project

[1] Physical scientist, International Data and Analysis.

[2] Unless otherwise indicated, values have been converted from Australian dollars ($A) to U.S. dollars at the rate of $A1.00=US$1.25.

basis. The ruling on 75% local equity participation in uranium projects was the most rigid of the new requirements. However, the former administration had insisted on 100% local ownership and control of new uranium projects at the production stage. The new 75% requirement would be fulfilled at the production stage, but beyond the production of yellowcake and enrichment stages, the ruling would not apply. A 50% equity rule applied to mineral projects (including oil and gas) which involve investments of more than $1 million and must satisfy a specified set of criteria. The foreign investment guidelines should aid companies in future planning, and also in raising the ever-growing capital sums required for new and developing mine projects.

Expenditures on mineral exploration increased by 2% to $101.6 million. Of the three major States, only Western Australia experienced an increase (6%), while exploration in New South Wales and Queensland decreased by 9% and 0.5%, respectively. Of the smaller States, only Victoria and Tasmania registered increases, 30% and 24%, respectively. Government mineral exploration expenditures totaled $10.9 million.

PRODUCTION

Australia's mineral production in 1975 recorded substantial increases in both value and volume. Most of the commodities listed in table 1 showed gains, and the total value of minerals produced was 17% greater than that reported for 1974. Commodities that showed decreases during the year included copper, tin, several minor metals, and some nonmetallics.

Table 1.—Australia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Aluminum:			
Bauxite, gross weight ____thousand tons__	17,596	19,994	20,958
Alumina ____do____	r 4,089	4,899	5,127
Metal, refined ____do____	207	219	214
Antimony, mine output (content of antimony and lead concentrates)	r 1,546	1,406	1,923
Beryllium, beryl, gross weight	162	79	e 90
Bismuth, mine output, metal content	454	1,170	854
Cadmium:			
Mine output, metal content	r 1,601	1,443	1,609
Smelter output (refined)	r 676	720	552
Cobalt, mine output (content of zinc and nickel concentrates)	r 776	1,078	2,600
Columbium-tantalum concentrates, gross weight [1]	r 199	128	132
Copper:			
Mine output, metal content	r 220,335	251,340	218,683
Blister:			
Primary	r 162,568	196,129	179,942
Secondary	r 3,211	3,641	4,230
Refined:			
Primary	r 145,295	162,461	165,341
Secondary	r 13,750	11,729	13,892
Gold:			
Mine output, metal content ____troy ounces__	r 552,156	512,611	524,957
Refined (excluding recovery from scrap) ____do____	487,469	415,869	481,682
Iron and steel:			
Iron ore, gross weight ____thousand tons__	r 84,828	96,950	97,653
Metal:			
Pig iron ____do____	7,658	7,250	7,476
Ferroalloys: [2]			
Ferrochromium, high carbon	2,802	3,351	NA
Ferromanganese, high carbon	40,066	42,660	NA
Ferrosilicon	8,361	8,982	NA
Silicomanganese	24,853	21,573	NA
Total	76,082	76,566	NA
Crude steel ____thousand tons__	7,684	7,755	7,845
Steel semimanufactures [2] ____do____	6,724	6,820	5,914
Lead:			
Mine output, metal content	r 402,796	375,304	407,169

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS—Continued			
Lead—Continued			
Metal:			
Primary:			
Bullion, for export	r 149,658	144,203	151,520
Refined	r 190,350	192,757	159,793
Total	r 340,008	336,960	311,313
Secondary (excluding remelt)	r 30,537	e 32,000	e 30,000
Manganese ore, gross weight ---thousand tons	1,522	1,522	1,555
Mercury ---76-pound flasks	16	2	6
Molybdenum, mine output, metal content	4	3	e 3
Nickel:			
Mine output, metal content	r 40,106	45,981	75,794
Metal, refined e	20,000	20,000	34,000
Platinum-group metals: [3]			
Palladium, metal content e ---troy ounces	r 750	r 860	1,400
Platinum, metal content e ---do	r 225	r 260	420
Total e ---do	r 975	r 1,120	1,820
Rare-earth minerals, monazite concentrate, gross weight	r 4,151	3,577	4,267
Selenium [4] ---kilograms	25,364	29,000	36,271
Silver:			
Mine output, metal content ---thousand troy ounces	r 22,744	21,539	23,449
Refined ---do	r 8,377	8,246	8,602
Tin:			
Mine output, metal content	r 10,801	10,481	9,114
Refined:			
Primary	6,904	6,714	5,254
Secondary	446	475	396
Titanium concentrates, gross weight:			
Ilmenite	719,601	816,746	1,013,100
Leucoxene	11,097	14,782	16,900
Rutile	335,231	318,702	344,035
Tungsten, mine output, metal content	r 1,322	1,125	1,533
Zinc:			
Mine output, metal content	r 480,482	457,059	502,630
Smelter:			
Dust	7,928	7,227	NA
Primary	r 299,453	276,831	193,335
Secondary	6,983	6,969	e 7,000
Zirconium concentrates, gross weight	r 375,108	367,772	382,190
NONMETALS			
Abrasives, natural:			
Beach pebble	1,327	1,470	NA
Garnet (sales)	273	83	NA
Asbestos	r 43,529	30,863	47,911
Barite	r 10,028	7,466	7,475
Cement, hydraulic ---thousand tons	5,247	5,204	5,017
Clays:			
Bentonite and bentonitic clay	899	803	e 800
Brick clay and shale ---thousand tons	r 8,072	8,727	7,302
Cement clay and shale [5] ---do	308	375	NA
Damourite clay (sales)	572	931	NA
Fire clay [5] ---thousand tons	114	137	NA
Fuller's earth	30	78	e 80
Kaolin and ball clay	79,973	98,152	e 100,000
Other [5] ---thousand tons	575	611	NA
Diatomite	r 4,602	7,438	4,806
Feldspar	r 2,804	4,145	3,029
Fertilizer materials:			
Crude, phosphate rock	r 1,144	1,484	139,821
Manufactured, phosphatic (P_2O_5 content) ---thousand tons	5,200	5,352	1,593
Fluorspar	r 1,569	238	e 240
Gem stones ---value, thousands	$151,283	$114,170	NA
Gypsum ---thousand tons	r 1,165	1,069	949
Lime [6]	817,511	941,548	e 950,000
Lithium minerals, petalite, gross weight	r 222	1	e 1
Magnesite	r 23,221	19,300	16,208
Perlite, crude	2,342	2,061	NA
Pigments, natural mineral, ocher	62	38	NA
Pyrite including cupreous:			
Gross weight	r 245,081	224,928	224,423
Sulfur content	r 116,831	107,554	105,876
Salt [7] ---thousand tons	r 4,116	4,935	e 4,990

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Sand and gravel:			
Construction sand ... thousand tons	22,925	24,520	NA
Gravel ... do	14,441	17,500	NA
Stone:			
Dolomite ... do	r 404	409	438
Limestone for cement e ... do	7,987	8,090	[5] 9,549
Limestone for other uses e ... do	3,236	2,956	
Silica in the form of quartz, quartzite, and glass sand ... do	1,259	[5] 1,443	NA
Other:			
Crushed and broken ... do	51,281	54,671	NA
Dimension [8] ... do	144	143	NA
Unspecified [9] ... do	37,023	33,656	NA
Sulfur:			
Byproduct [10] ... do	r 438	411	438
Sulfuric acid (from source materials) ... do	2,383	2,431	1,151
Talc, soapstone, pyrophyllite ... do	r 63,670	79,837	81,354
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous and subbituminous ... thousand tons	r 60,653	63,033	66,939
Lignite ... do	24,676	27,303	28,177
Total ... do	r 85,329	90,336	95,116
Coke:			
Metallurgical ... do	4,945	5,114	5,239
Gashouse (including breeze) ... do	64	65	e 65
Total ... do	r 5,009	5,179	e 5,304
Fuel briquets ...	1,182	1,155	1,030
Gas, natural, marketable production ... million cubic feet	r 144,763	159,300	177,477
Natural gas liquids e ... thousand 42-gallon barrels	r 17,688	17,300	18,500
Petroleum:			
Crude ... do	r 142,276	140,911	149,880
Refinery products:			
Aviation gasoline ... do	252	440	252
Other gasoline ... do	75,113	76,283	78,220
Jet fuel ... do	r 11,284	13,284	13,844
Kerosine ... do	1,377	1,365	1,233
Distillate fuel oil ... do	44,167	45,633	50,545
Residual fuel oil ... do	r 36,997	33,040	29,820
Lubricants ... do	2,648	2,705	2,440
Other:			
Refinery gas [11] ... do	887	793	742
Liquefied petroleum gas ... do	4,145	3,919	4,082
Solvents ... do	1,705	1,824	1,258
Bitumen ... do	2,950	2,900	2,830
Unspecified ... do	r 9,372	8,542	8,680
Refinery fuel and losses ... do	r 15,536	15,844	15,234
Total ... do	r 206,433	206,572	209,180

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

TRADE

The trade data summaries, shown in tables 2 and 3, respectively, have been compiled principally from Overseas Trade, published by the Australia Bureau of Statistics and cover the official July 1 to June 30 annual reporting period; therefore, the data are not comparable with calendar year data presented elsewhere in this review.

Among mineral commodities exported in 1975, about one-half showed an increase, despite reduced demand in world markets. Exports of primary aluminum, coal, copper, iron and steel, nickel, and tungsten concentrates increased significantly. Although exports of such major commodities as lead, zinc, alumina, and ilmenite concentrate declined, the overall export value reached a record \$3.1 billion because of substantial price increases for a number of products. This exceeded the previous record in 1974 by 29%. Alumina exports in 1975 totaled about 4.5 million tons, compared with 4.7 million exported during 1974. However, because of a considerable increase in the average value from \$50.30 to \$76.16 per ton, f.o.b., the total value of alumina exports in 1975 was \$344 million, 37% higher than the \$251 million recorded in 1974. Lower domestic demand for primary aluminum resulted in increased availability for exports, and exports in 1975 totaled 76,700 tons, valued at \$46.2 million. The quantity was 45% higher than in 1974.

Exports of coal increased 3% to 30.2 million tons, despite reduced shipments late in 1975. Exports from New South Wales increased 8% to 14.8 million tons, while those from Queensland increased 1% to 15.4 million tons. Shipments to Japan declined for the second consecutive year. The drop from 23.1 million to 22.9 million tons in 1975 was attributed to industrial unrest in Australia and depressed conditions in the Japanese steel industry. Coal exports to Europe increased 29% to 6.1 million tons during the year.

Exports of iron ore and iron ore pellets decreased 4% to 80.4 million tons in 1975 compared with 1974. A 7% reduction (to 62 million tons) in exports to Japan was partly offset by a 6% increase (to 18.8 million tons) to Europe. Although the quantity of iron ore exported was less in 1975, the increased prices obtained resulted in an increase in value from \$589 million in 1974 to \$749 million in 1975. The value of iron ore exports amounted to 24.2% of the total value of mineral exports (excluding gold), compared with 24.5% in 1974. The value of gold shipments was excluded from the total value of mineral exports in accordance with international standards whereby shipments of refined gold and bullion were not classified as merchandise trade.

Lead and zinc exports dropped substantially in 1975 because of reduced world demand, particularly for zinc. Shipments of zinc concentrates to Japan, Australia's largest market, were greatly reduced following cutbacks in Japanese refinery output of zinc. No sales of refined lead were made to the United States during the year. Exports to this traditional market were sharply reduced in 1974 following an antidumping ruling against Australian producers late in 1973. The value of copper exports in 1975 fell because of lower prices, but the tonnage of copper metal exported increased. Nickel exports showed a gain of 84% to \$176 million. The increase was the result of both greater tonnage and higher prices. Other commodities for which significant increases in the value of exports were recorded included tin, rutile concentrate, tungsten concentrate, and manganese ore. Australia shipped minerals and metal to more than 100 countries in 1975, but Japan, the United States, the United Kingdom, and countries of the European Economic Community (EEC) accounted for about 90% of the total exports.

The value of imports of mineral products increased in 1975 to \$634 million, 9% over that of 1974. Crude oil was the major import item, and the value of crude oil represented 76% of the total imports. Imports of oil totaled 55.9 million barrels, 11% less than the quantity imported in 1974. The value of crude oil imports in 1975 was \$480 million, compared with \$420 million in 1974. The value of both 1974 and 1975 oil imports reflects substantial price increases imposed by the Organization of Petroleum Exporting Countries (OPEC) in 1973. Australia also imported large quantities of sulfur, asbestos, and industrial diamond.

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

(Metric tons unless otherwise specified)

Commodity	1972–73	1973–74	Principal destinations, 1973–74
METALS			
Aluminum:			
Bauxite, gross weight[2]	6,701	[2] 7,936	Japan 3,155; West Germany 2,361; Italy 1,439.
Alumina, gross weight	r 2,986	3,881	NA.
Metal:			
Scrap	1,640	1,204	Japan 425; United States 330; Taiwan 134; France 121.
Unwrought	81,462	42,492	NA.
Semimanufactures	5,007	7,043	New Zealand 2,845; Indonesia 1,231.
Beryllium ore and concentrate, gross weight	168	105	All to United States.
Cadmium metal, refined, unwrought and semimanufactures	594	513	United States 309; Netherlands 88.
Chromium:			
Chromite ore and concentrate, gross weight	--	187	Indonesia 68; Singapore 35; Papua New Guinea 30.
Chromium oxides and hydroxides	11	26	Mainly to New Zealand.
Columbium and tantalum, columbite-tantalite concentrate, gross weight	r 304	141	United States 71; West Germany 32; Japan 25.
Copper:			
Ore and concentrate, gross weight	164,254	175,136	Mainly to Japan.
Matte	7,012	5,113	Belgium-Luxembourg 3,613; United Kingdom 1,500.
Metal including alloys:			
Copper-lead dross and speiss	2,817	1,410	Mainly to United States.
Copper slags and residues	18	288	United Kingdom 153; Belgium-Luxembourg 88.
Scrap including alloy scrap	733	311	United Kingdom 114; Spain 68; West Germany 58.
Unwrought:			
Blister and cement	7,797	10,426	All to Japan.
Other, unalloyed	49,967	50,678	West Germany 15,734; France 12,912; United Kingdom 11,691.
Alloyed	64	25	New Zealand 12; Malaysia 11.
Semimanufactures:			
Unalloyed	7,827	19,990	New Zealand 8,704; Singapore 2,328; Malaysia 2,311.
Alloyed	4,611	4,907	New Zealand 1,773; Hong Kong 1,474; Singapore 608.
Gold:			
Ore and concentrate, metal content[3] troy ounces	r 151,076	181,362	Mainly to Papua New Guinea.
Metal:			
Mint bullion do	293,207	72,388	United Kingdom 45,897; Hong Kong 25,967.
Refined and unrefined bullion do	35,287	83,370	United Kingdom 64,536; Japan 9,577.
Iron and steel:			
Ore and concentrae thousand tons	66,294	68,769	Mainly to Japan.
Metal:			
Scrap do	543	575	NA.
Pig iron and equivalent materials do	687	935	Japan 450; People's Republic of China 410.
Ferroalloys	184	682	New Zealand 534; Philippines 80.
Steel ingots and other primary forms thousand tons	757	808	Japan 235; West Germany 170.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	155	112	New Zealand 64; Papua New Guinea 13.
Universals, plates sheets do	351	152	New Zealand 50; Malaysia 18; Philippines 16; United States 16.
Hoop and strip do	10	8	Mainly to New Zealand.
Rails and accessories do	25	11	New Zealand 8; Fiji 1.
Wire do	22	21	New Zealand 11; United States 3; Papua New Guinea 2.
Tubes, pipes, fittings do	82	69	New Zealand 8; Singapore 5.
Castings and forgings rough do	2	5	Mainly to Papua New Guinea.
Total do	647	378	

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1972–73	1973–74	Principal destinations, 1973–74
METALS—Continued			
Lead:			
Ore and concentrate, gross weight	74,143	77,678	United States 40,137; United Kingdom 22,553; Japan 14,988.
Slag and residue	6,629	36,072	Mainly to United States.
Oxides	2,826	3,547	Malaysia 850; New Zealand 407.
Metal including alloys:			
Scrap including alloys scrap	263	937	Republic of South Africa 307; United States 252.
Unwrought:			
Bullion, lead-silver, lead content	142,270	147,820	Mainly to United Kingdom.
Refined	149,691	134,158	United Kingdom 36,821; India 21,692.
Alloys, antimonial and other	5,412	6,243	Taiwan 1,649; New Zealand 1,636; Malaysia 920.
Semimanufactures	3,068	1,588	Japan 406; Indonesia 152; Netherlands 133.
Magnesium oxide	1,419	108	New Zealand 88; United Kingdom 20.
Manganese ore, gross weight	87,000	71,922	Japan 33,945; United States 29,736; Thailand 8,027.
Nickel metal and alloys: [4]			
Unwrought value, thousands	NA	$44,741	NA.
Semimanufactures do	NA	$19,938	NA.
Platinum-group metals troy ounces	76,812	26,640	Hong Kong 21,359; Singapore 3,534.
Rare-earth metals, monazite concentrate, gross weight	4,858	3,772	France 2,531; West Germany 400.
Silver:			
Concentrates and lead-silver bullion, silver content [3] thousand troy ounces	r 13,645	13,037	NA.
Mint bullion do	5,570	3,225	Mainly to Japan.
Other do	244	181	Mainly to New Zealand.
Tin:			
Ore and concentrate, gross weight	11,281	8,641	Malaysia 5,349; United Kingdom 2,056.
Oxides	30	17	New Zealand 11; Japan 5; Canada 1.
Metal including alloys:			
Unwrought	3,978	2,821	United States 1,136; Netherlands 602; New Zealand 310.
Semimanufactures	86	582	Papua New Guinea 248; New Zealand 219.
Titanium ores and concentrates, gross weight:			
Ilmenite (excluding beneficiated ilmenite)	523,740	710,670	United Kingdom 226,938; France 171,752; Japan 146,019.
Leucoxene	18,627	16,618	Mainly to United States.
Rutile	338,509	354,126	United States 137,731; United Kingdom 72,499; Netherlands 36,543.
Tungsten ores and concentrates, gross weight:			
Scheelite	1,532	1,617	West Germany 927; United Kingdom 304.
Wolframite	836	368	Japan 198; United Kingdom 106.
Uranium and thorium ores and concentrates, excluding monazite	3	15	Mainly to France.
Vanadium ore and concentrate	--	418	Italy 232; West Germany 112.
Zinc:			
Ore and concentrate, gross weight	300,773	426,178	Japan 213,386; United Kingdom 66,347; Netherlands 60,445.
Oxide	1,315	1,940	Indonesia 692; Philippines 414; Hong Kong 245.
Metal including alloys:			
Slags and residues	5,014	6,613	Republic of South Africa 2,441; Taiwan 2,083; Belgium-Luxembourg 961.
Unwrought	203,898	164,778	United States 27,857; United Kingdom 21,041; New Zealand 19,880; India 19,009.
Semimanufactures	1,333	2,439	New Zealand 405; Japan 400.
Zirconium ores and concentrates, gross weight, minimum 30% $ZrSiO_4$	419,457	400,427	Japan 139,422; United States 72,231; Italy 43,532.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1972–73	1973–74	Principal destinations, 1973–74
METALS—Continued			
Other:			
Ore and concentrate of base metals, n.e.s. value, thousands	$122,889	$79,349	NA.
Waste and scrap containing nonferrous metals	9,753	15,489	Singapore 12,764; United Kingdom 1,750.
Oxides, hydroxides and peroxides of metals n.e.s value, thousands	r $3,399	$4,537	Philippines $705; Hong Kong $527.
Metals including alloys, all forms:			
Unwrought and semimanufactures:			
Magnesium, beryllium and their alloys	30	59	New Zealand 45: Singapore 13.
Molybdenum, tungsten and their alloys	8	8	Philippines 5; United Kingdom 1; New Zealand 1.
Base metals including alloys, all forms value, thousands	r $672	$274	New Zealand $151; India $65.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc. value, thousands	r $95	$151	Japan $101; Philippines $24.
Dust and powder of precious and semiprecious stones do	r $28	$50	Philippines $19; New Zealand $16; Thailand $15.
Grinding and polishing wheels and stones do	r $458	$510	New Zealand $205; Philippines $79; Indonesia $66.
Asbestos, crude and fiber	27,817	29,372	Mainly to Japan.
Barite and witherite	5,488	1,079	Mainly to New Zealand.
Cement, hydraulic	9,987	112,779	Singapore 86,896: Reunion Island 10,200.
Clays and clay products (including all refractory brick):			
Crude clays including fire clay and sillimanite	5,581	6,043	United Kingdom 3,696; Japan 1,296; New Zealand 880.
Products:			
Refractory:			
Bricks	2,352	3,193	New Zealand 951; India 612; Indonesia 597.
Other value, thousands	r $582	$683	New Zealand $127; Nauru $108; Taiwan $85; Singapore $78.
Nonrefractory do	r $208	$321	New Zealand $125; Papua New Guinea $95; Fiji $37.
Diamond:			
Gem, not set or strung carats	4,154	7,178	New Zealand 2,700; Hong Kong 1,413; Israel 1,144; Belgium-Luxembourg 1,125.
Industrial do	103,151	160,695	Ireland 98,360; United Kingdom 30,232; Philippines 23,952.
Fertilizer materials:			
Crude, nitrogenous	6	69	Mainly to United States.
Manufactured:			
Nitrogenous	21,430	37,860	Indonesia 19,450; Philippines 16,150.
Phosphatic (excluding basic slag)	5,529	70	Mainly to Papua New Guinea.
Potassic	--	15	NA.
Other including mixed	59,484	1,453	Singapore 1,181; United Kingdom 182.
Ammonia value, thousands	r $864	$6,237	Mexico $4,393; Malaysia $1,154.
Gem stones, except diamond:			
Opals do	r $22,509	$21,928	Hong Kong $10,212; United States $3,820; Italy $3,626.
Sapphires do	r $3,747	$4,278	Thailand $1,566; Hong Kong $497.
Other do	r $1,253	$1,631	Hong Kong $389; United States $360; New Zealand $200.
Gypsum	297,136	390,028	New Zealand 162,423; Japan 106,230; Philippines 39,812.
Lime (quicklime, slaked lime, hydraulic lime)	640	5,123	Mainly to Papua New Guinea.
Magnesite	--	975	Mainly to United States.
Mica, worked and articles value, thousands	r $57	$65	All to New Zealand.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1972–73	1973–74	Principal destinations, 1973–74
NONMETALS—Continued			
Pigments, mineral:			
Micaceous iron oxide	38	51	Japan 20; New Zealand 9; Singapore 9.
Iron oxides, other	7	67	New Zealand 30; Japan 18; Singapore 11.
Pyrite, unroasted, gross weight	15	109	Mainly to Papua New Guinea.
Salt and brine thousand tons	2,863	4,063	Mainly to Japan.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	465	785	New Zealand 321; Fiji 314.
Caustic potash	9	62	New Zealand 54; Fiji 9.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	1,621	2,347	Mainly to Japan.
Worked value, thousands	$31	$46	United States $33; Nauru $4.
Sand, gravel, limestone flux and other calcareous stone	387,987	554,536	Mainly to Japan.
Sulfur, sulfuric acid	10,830	14,088	Do.
Talc, steatite, soapstone, pyrophyllite	31,402	47,601	Japan 29,621; Netherlands 15,963.
Other nonmetals, n.e.s.:			
Crude:			
Quartz, mica, feldspar, fluorspar, cryolite, chiolite	2,140	1,539	Japan 1,183; New Zealand 346.
Refractory materials, except clays and magnesite	151	48	Philippines 21; Papua New Guinea 14; New Zealand 11.
Other value, thousands	r $481	$117	Japan $43; New Zealand $20; United States $14.
Oxides and hydroxides of magnesium, strontium, barium	373	666	New Zealand 520; Philippines 121.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s value, thousands	r $2,676	$3,307	Papua New Guinea $841; New Zealand $416.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	r 21,695	22,941	New Zealand 6,379; Taiwan 4,588; Indonesia 3,974.
Coal, bituminous and lignite and peat (including briquets):			
Bituminous coal and briquets thousand tons	25,800	27,853	Mainly to Japan.
Lignite, peat and briquets thereof	6	2	All to Malaysia.
Coke and semicoke thousand tons	204	141	Japan 26; Netherlands 46; New Caledonia 30.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	2,077	1,918	Mainly to Japan.
Refinery products:			
Gasoline do	1,428	3,231	Mainly to New Zealand.
Jet fuel do	1,422	1,928	New Zealand 989; Fiji 538; Singapore 238.
Kerosine do	246	480	New Zealand 398; Fiji 49.
Distillate fuel oil do	2,436	4,653	New Zealand 2,281; United Kingdom 692; Fiji 610.
Residual fuel oil do	3,408	3,189	Mainly to Japan.
Lubricants	847	632	New Zealand 242; Malaysia 125; Philippines 82.
Other do	270	359	Mainly to New Zealand.
Mineral tar and other coal–, petroleum–, or gas–derived crude chemical value, thousands	r $1,147	$3,324	New Zealand $1,866; West Germany $818; United States $506.

r Revised. NA Not available.

[1] Data are for years beginning July 1.

[2] Compiled from import statistics of selected trading partner countries.

[3] Source: Bureau of Mineral Resources, Geology and Geophysics. Australian Mineral Industry: Quarterly Review—Quarterly Statistics. V. 28, No. 4, December 1975, and are for years beginning March 1 of that stated.

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

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

(Metric tons unless otherwise specified)

Commodity	1972–73	1973–74	Principal sources, 1973–74
METALS			
Aluminum:			
Oxide and hydroxide	3,847	4,708	Japan 1,566; United States 1,243; West Germany 577.
Metal including alloys:			
Scrap	997	2,940	Mainly from New Zealand.
Unwrought	712	9,083	Canada 6,949; New Zealand 1,835.
Semimanufactures	3,523	8,122	United States 3,221; United Kingdom 1,316.
Antimony metal, all forms	80	125	People's Republic of China 61; United Kingdom 43; Japan 20.
Arsenic trioxide, pentoxide, acids	1,130	1,315	Territory of South-West Africa 320; Sweden 300; France 276; United States 244.
Beryllium metal including alloys, all forms value	r $2,882	$5,763	Mainly from United States.
Bismuth metal including alloys, all forms	11	14	United Kingdom 9; Japan 2.
Cadmium metal including alloys, all forms	15	10	Mainly from U.S.S.R.
Chromium:			
Chromite	586	8,270	Philippines 7,113; Republic of South Africa 1,157.
Oxide, hydroxide, trioxide	589	1,585	U.S.S.R. 610; United States 550; West Germany 252.
Metal including alloys, all forms	24	45	Japan 32, United Kingdom 13.
Cobalt:			
Oxide and hydroxide	8	38	United States 25; Belgium-Luxembourg 8.
Metal including alloys, all forms	128	198	Zaire 93; Zambia 30; Belgium-Luxembourg 25.
Copper:			
Ore and concentrate	1	NA	
Copper sulfate	2,593	2,575	Mainly from New Zealand.
Metal including alloys:			
Scrap:			
Unalloyed	1,434	1,143	New Zealand 686; Papua New Guinea 251.
Alloyed	1,592	1,106	New Zealand 453; Papua New Guinea 243; Solomon Islands 189.
Unwrought	630	1,552	United Kingdom 1,029; Israel 333.
Semimanufactures	4,488	[2] 20,601	Mainly from United Kingdom.
Gold:			
Ore and concentrate	12	16	All from Fiji.
Crude bullion, gold content troy ounces	99,709	89,830	Fiji 77,644; Papua New Guinea 10,975.
Refined bullion do	5,130	660	Papua New Guinea 453; New Zealand 182.
Iron and steel:			
Ore and concentrate, including roasted pyrite	24,988	13,964	Canada 12,317; Philippines 1,018.
Metal:			
Scrap	141	114	New Zealand 28; Solomon Island 27; Papua New Guinea 14.
Sponge iron, powder and shot	6,108	7,265	Sweden 2,821; Japan 1,653; United Kingdom 1,014.
Spiegeleisen	29	30	All from West Germany.
Ferroalloys:			
Powder:			
Ferromanganese	552	374	Japan 285; West Germany 88.
Other	179	1,186	Republic of South Africa 902; Japan 120.
Shot:			
Ferrochromium	7,645	14,646	Republic of South Africa 6,870; India 3,441; Yugoslavia 2,510.
Ferromanganese	5,817	12,196	Mainly from Republic of South Africa.
Ferromolybdenum	243	253	United States 139; United Kingdom 73; Canada 28.
Ferrosilicon	9,202	14,286	Republic of South Africa 7,793; Norway 2,844; Japan 856.
Ferronickel	1,337	1,450	All from New Caledonia.
Other	2,976	3,324	Mainly from Republic of South Africa.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1972–73	1973–74	Principal sources, 1973–74
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Steel, primary forms	60,255	212,494	Mainly from Japan.
Semimanufactures:			
Bars, rods, angles, shapes, and sections	34,426	60,462	Japan 32,092; United States 7,147; United Kingdom 5,642.
Universals, plates, sheets	221,104	371,196	Japan 259,832; Republic of Korea 32,301; United States 30,767.
Hoop and strip	31,695	49,328	Japan 25,426; United States 8,576.
Rails and accessories	322	15,925	Mainly from Japan.
Wire	10,541	45,483	Japan 15,463; Belgium-Luxembourg 13,884.
Tubes, pipes, fittings	140,815	[3] 239,355	Mainly from Japan.
Castings and forgings, rough value, thousands	r $223	$222	United States $141; United Kingdom $66.
Lead:			
Oxides	26	33	United Kingdom 19; Republic of South Africa 10.
Metal including alloys:			
Scrap	412	326	New Zealand 158; Papua New Guinea 84; Fiji 44.
Unwrought and semimanufactures	44	98	United States 69; New Zealand 10.
Magnesium metal including alloys, all forms	1,498	2,544	U.S.S.R. 1,213; Norway 878; United States 345.
Manganese:			
Ore and concentrate:			
Battery grade	1,524	299	All from United States.
Metallurgical grade	3,346	1,606	Mainly from People's Republic of China.
Oxides	1,130	1,087	Japan 640; United States 358.
Metal including alloys, all forms	721	950	Japan 637; Republic of South Africa 296.
Mercury 76-pound flasks	1,596	2,974	Spain 1,684; Philippines 435.
Molybdenum:			
Ore and concentrate	359	469	Canada 203; United States 202; West Germany 62.
Metal including alloys, all forms:			
Wire	6	8	Mainly from United States.
Other value, thousands	r $91	$88	United States $49; United Kingdom $22.
Nickel:			
Matte, speiss, and similar materials	929	177,362	All from Canada.
Metal including alloys:			
Scrap	28	5	All from New Zealand.
Unwrought	1,103	2,496	Mainly from Canada.
Semimanufactures	658	1,344	United Kingdom 500; United States 300.
Platinum-group metals and silver:			
Ore and concentrate	21	23	All from New Zealand.
Waste and sweepings value, thousands	r $256	$388	Mainly from New Zealand.
Metals including alloys:			
Platinum group troy ounces	180,762	1,392,796	Mainly from United States.
Silver containing 75% or more silver, silver content do	77,033	99,047	Hong Kong 41,736; Fiji 26,916; United States 13,656.
Silicon metal	2,366	2,496	Norway 578; Sweden 487; Canada 392; France 285.
Tin:			
Oxides	r 43	9	West Germany 5; United Kingdom 3.
Metal including alloys:			
Scrap	--	4	All from New Zealand.
Unwrought	r 65	67	Mainly from Malaysia.
Semimanufactures	r 39	1,134	Mainly from Japan.
Tungsten:			
Ore and concentrate	1	(4)	All from United Kingdom.
Metal including alloys, all forms	11	14	United States 8; United Kingdom 4.
Zinc:			
Ore and concentrate	18	21,935	All from Canada.
Oxides	771	1,574	Canada 823; United States 308; New Zealand 176.
Metal including alloys, all forms	102	119	New Zealand 85; United States 19; United Kingdom 14.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1972–73	1973–74	Principal sources, 1973–74
METALS—Continued			
Other:			
Ore and concentrate:			
Of niobium, tantalum, titanium, vanadium, zirconium	1	60	United States 18; Japan 9.
Of base metals not elsewhere specified	2,448	12,048	Guyana 6,187; United States 4,510.
Ash and residue containing nonferrous metals	5,645	12,829	Mainly from Chile.
Oxides, hydroxides and peroxides of metals, n.e.s	895	230	Norway 141; New Zealand 56; United Kingdom 31.
Metals including alloys, all forms:			
Metalloids	3,224	2,820	Canada 2,177; United States 370.
Alkali, alkaline earth and rare-earth metals	101	70	United Kingdom 24; Australia 17; Japan 15; United States 11.
Base metals including alloys, all forms n.e.s	122	429	United States 275; Japan 65.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	1,308	1,396	United States 663; United Kingdom 278; New Zealand 239.
Grinding and polishing wheels and stones	979	1,301	West Germany 275; United Kingdom 207; Japan 139.
Asbestos:			
Chrysotile	50,014	40,165	Mainly from Canada.
Amosite	7,587	10,070	Mainly from Republic of South Africa.
Other	3,773	6,816	Mainly from Canada.
Barite and witherite, natural and ground	1,209	9,532	Thailand 3,948; United States 3,212; People's Republic of China 1,300; Singapore 1,000.
Boron materials:			
Crude natural borates	1,301	1,075	All from United States.
Oxide and acid	3,330	3,090	Mainly from United States.
Cement, hydraulic	[5] 8,240	[5] 48,811	Japan 26,189; United Kingdom 5,654.
Chalk	8,782	9,589	United Kingdom 6,269; France 2,392.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	63,139	69,054	Mainly from United States.
Fire clay and ball clay	9,968	669	Mainly from United Kingdom.
Andalusite, mullite, chamotte, dinas earths	8,464	14,513	Mainly from Republic of South Africa.
Kyanite and sillimanite	490	737	Mainly from United States.
White clays	37,535	33,592	United Kingdom 18,008; United States 15,521.
Other	17,936	20,375	United States 13,843; Republic of South Africa 5,677.
Products:			
Refractory (including nonclay bricks)	[6] 21,689	[6] 15,684	United Kingdom 6,809; Japan 2,886; United States 2,722.
Nonrefractory ____value, thousands	[r] $21,317	$32,192	Japan $23,179; Italy $3,196.
Croylite and chiolite	216	506	Denmark 279; France 227.
Diamond:			
Gem, not set or strung ____carats	59,416	198,213	Belgium-Luxembourg 147,458; Israel 19,398.
Industrial, including dust ____do	807,960	1,089,969	United States 315,956; Republic of South Africa 275,263; Ireland 248,233.
Diatomite and other infusorial earth	8,641	8,159	Mainly from United States.
Feldspar, leucite, nepheline	11,148	13,653	Norway 10,602; Canada 1,685.
Fertilizer materials:			
Crude:			
Nitrogenous	3,572	3,920	Mainly from Chile.
Phosphatic ____thousand tons	2,282	3,109	Nauru 1,695; Christmas Island 944; Gilbert and Ellice Islands 410.
Manufactured:			
Nitrogenous	13,260	6,535	Japan 3,550; West Germany 1,859.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1972–73	1973–74	Principal sources, 1973–74
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured—Continued			
Phosphatic	2,044	1,816	Mainly from Japan.
Potassic	165,412	182,881	United States 97,113; Canada 82,998.
Other including mixed	6,271	5,201	West Germany 3,760; United States 531.
Ammonia ____value	r $2,845	$396,220	Mainly from Iran.
Fluorspar	15,716	30,332	Republic of South Africa 15,969; Brazil 6,300; Italy 4,704.
Graphite, natural	1,253	2,180	Sri Lanka 878; People's Republic of China 539; Republic of Korea 57.
Gypsum and plasters	855	918	United Kingdom 453; United States 239; West Germany 112.
Iodine	48	54	Mainly from Japan.
Lime ____value	r $18,495	$31,698	United Kingdom $12,967; New Zealand $7,204.
Magnesite, crude, calcined, and fused	2,174	742	Japan 501; United States 156.
Mica:			
Crude, including splittings and waste	1,080	1,188	Republic of South Africa 374; People's Republic of China 350; India 317.
Worked, including agglomerated splittings, value	r $209,137	$329,943	West Germany $122,468; United States $79,244.
Pigments, mineral:			
Natural, crude	1,033	1,004	Austria 462; Republic of South Africa 197; Cyprus 106.
Iron oxides, processed	9,182	11,940	West Germany 7,944; Spain 1,187.
Precious and semiprecious stones, except diamond:			
Natural ____value, thousands	r $4,904	$6,296	United Kingdom $1,530; Hong Kong $790.
Manufactured ____do	r $603	$490	Austria $130; Switzerland $105; West Germany $59.
Pyrite (gross weight)	13	NA	
Salt	13,545	5,441	Mainly from United Kingdom.
Sodium and potassium compounds, n.e.s.:			
Caustic soda ____value, thousands	r $18,445	$22,747	NA.
Caustic potash, sodic and potassic peroxides	1,939	2,152	India 671; France 495; West Germany 462.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcarious	4,414	3,455	Mainly from Italy.
Slate	309	464	Republic of South Africa 261; Italy 117.
Other	1,898	1,267	Republic of South Africa 670; Finland 427.
Worked ____value, thousands	r $710	$1,085	Italy $732; Spain $99.
Dolomite	755	450	West Germany 315; United States 124.
Gravel and crushed rock	601	419	France 139; Belgium-Luxembourg 102; United States 72.
Limestone (except dimension)	981,365	1,370,343	All from Japan.
Quartz and quarzite	696	846	Sweden 506; West Germany 163; United States 109.
Sand, excluding metal bearing	827	827	New Zealand 215; Sweden 212; United States 171.
Sulfur:			
Elemental:			
Other than colloidal	498,275	608,092	Canada 380,928; United States 192,230.
Colloidal	76	115	United States 55; West Germany 24; Netherlands 20.
Sulfur dioxide	432	351	Netherlands 120; Japan 110 United States 106.
Sulfuric acid, oleum	169	5	West Germany 2; United Kingdom 1.
Talc, steatite, soapstone, pyrophyllite	1,373	1,700	People's Republic of China 850; United States 511.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1972–73	1973–74	Principal sources, 1973–74
NONMETALS—Continued			
Vermiculite	4,266	3,215	Republic of South Africa 2,737; People's Republic of China 400.
Other nonmetals n.e.s.:			
Crude	1,311	1,439	Canada 555; United States 260; United Kingdom 237.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	237	9	Fiji 6; West Germany 3.
Slag and ash, n.e.s	11	NA	
Oxides and hydroxides:			
Magnesium	16,114	13,592	Japan 9,680; United Kingdom 3,271.
Strontium and barium	9,020	2,848	Japan 2,326; United States 340.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals n.e.s value, thousands	r $313	$249	United Kingdom $101; Japan $48.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,033	1,089	United States 770; Trinidad and Tobago 290.
Carbon black	2,265	2,402	United States 1,375; United Kingdom 437; West Germany 243.
Coal, all types including briquets	10,101	8,140	Republic of South Africa 5,455; United States 1,962.
Coke and semicoke	874	2,524	United States 1,890; Norway 511.
Peat	5,361	4,340	West Germany 3,536; Ireland 445.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	59,108	64,201	Kuwait 24,119; Saudi Arabia 15,479; Iraq 10,362.
Refinery products:			
Gasoline do	4,439	2,667	Iran 1,289; Bahrain 829; Singapore 460.
Jet fuel do	270	300	Bahrain 129; Singapore 127; Iran 43.
Kerosine do	600	638	People's Democratic Republic of Yemen 369; Iran 14; Bahrain 102.
Distillate fuel oil do	4,073	3,364	Singapore 1,477; Bahrain 1,306.
Residual fuel oil do	13,893	18,426	Singapore 6,361; Bahrain 3,718; Iran 3,699.
Lubricants do	238	319	United States 147; Netherlands 127.
Other:			
Liquefied petroleum gas do	1	2	Netherlands 1.
Bitumen and other residues and bituminous mixtures, n.e.s. do	29	46	Mainly from Singapore.
Petroleum coke do	656	368	Mainly from United States.
Unspecified do	3,077	3,651	Bahrain 3,053.
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals value, thousands	r $2,891	$3,939	Mainly from United States.

r Revised. NA Not available.
[1] Data are for years beginning July 1.
[2] Partial figure excludes quantity valued at $462,497 in 1974.
[3] Partial figure excludes quantity valued at $5,753,114 in 1974.
[4] Less than ½ unit.
[5] Partial figure excludes quantity valued at $2,968,000 in 1973 and $1,107,000 in 1974.
[6] Partial figure excludes quantity valued at $203,446 in 1973 and $235,334 in 1974.

COMMODITY REVIEW

METALS

Aluminum.—The rapid growth in the Australian aluminum industry in recent years was reversed in 1975. Australia's aluminum companies traded extensively in international and domestic markets, and in both areas performance was down. Owing to cuts in smelter production by Comalco Industries Pty., Ltd. in December 1974, and by Alcan Australia Ltd. early in 1975, output of primary aluminum was 2% lower than that of 1974. The major reason for the slump in output was a recession in the building industry, which adversely affected demand for semifabricated products. Alumina production increased slightly to 5.1 million tons (4.9 million tons in 1974), with the completion of an expansion program at Pinjarra in 1974 and steady progress at Gove towards design capacity. Output from alumina refineries, however, as well as those at Gladstone and Kwinana, was restricted as a result of the worldwide decrease in demand for aluminum. Production cuts affecting output at Gladstone, Kwinana, and Pinjarra were announced in February 1975. The output of about 21 million tons of bauxite in 1975 was 5% above the 1974 level. Production by Comalco at Weipa declined, mainly because of industrial disputes. Production of both Alcoa Pty. Ltd. at Pinjarra and Nabalco Pty. Ltd. at Gove increased, offsetting the decline at Weipa.

The world's largest bauxite deposits, located at Weipa, on Cape York Peninsula in Queensland, had reserves estimated at 2.2 billion tons, with an alumina (Al_2O_3) content of more than 50%. The bauxite, in the form of fine reddish pebbles, forms a flat-lying surface deposit, ranging from 1 to 10 meters in thickness. The bauxite was mined by Comalco, which is owned 45% by Conzinc Riotinto of Australia Ltd. (CRA), 45% by Kaiser Aluminum and Chemical Corp., and 10% by Australian and New Zealand shareholders. Annual production capacity was 10.5 million tons of bauxite. Production of bauxite by Comalco in 1975 was 9.1 million tons, 200,000 tons below the level of production in 1974, due mainly to the effects of a strike at Weipa toward yearend. There was also a decline in demand for bauxite by overseas customers as the year closed. Of the 1975 tonnage shipped, 4.7 million tons (52%) went to Gladstone for processing into alumina, 1.3 million tons (14%) to Japan, and 3.1 million tons (34%) to Europe and other areas, including 1.3 million tons to Euralumina S.p.A. in Italy. Sales to customers other than companies within the Comalco group amounted to 8.3 million tons in 1975, which was 200,000 tons less than 1974. The company continued its program of progressively developing the Andoom mining area to the north of Weipa, and more than 50% of the company's bauxite output will come from that area in 1976. Sales of calcined bauxite, used in abrasives, were down sharply. Because of this downturn, one of the kilns at Weipa was closed for several months.

In 1975, the output of primary aluminum from the Bell Bay smelter and Comalco's share of metal from the Bluff smelter amounted to 137,544 tons, a decrease of 2.4% from that of 1974. Although the company was unable to increase sales of primary metal to overseas customers in Japan, Canada, the United Kingdom, South East Asia, and the People's Republic of China, the sales price was attractive.

Deposits at Jarradale and Del Park in the Darling Ranges, Western Australia, were mined by Alcoa of Australia Ltd. Reserves in the area amounted to some 510 million tons of bauxite averaging 35% Al_2O_3. Processing of bauxite from Jarradale was conducted at the company's Kwinana alumina refinery. Production for the two operations totaled 5.2 million tons. Jarradale contributed 60% of the total and Del Park, 40%.

Alcoa Pty. Ltd. began production of hydrated alumina at Kwinana. The plant, constructed at a cost of $550,000, has a rated capacity of 50,000 tons per year and will supply both local and overseas markets.

A deposit estimated at 260 million tons of bauxite averaging around 50% Al_2O_3 was mined at Gove, Northern Territory. Mining and refining facilities were operated by Gove Alumina Ltd., the Australian-owned partner in Nabalco. Bauxite produced at Gove during 1975 totaled 1.9 million tons, and the current annual production capacity is about 4 million tons. Over half was processed at Nabalco's Gove refinery, while the balance was exported.

Plans by Alumax Inc. (owned by AMAX Inc. of the United States and Mitsui Mining Co. Ltd. of Japan) to develop about 235 million tons of a lateritic bauxite deposit on the Mitchell Plateau in the Kimberley region, Western Australia, were deferred until world demand for aluminum improves. The deposit has an average thickness of 4 meters and is spread over a wide area, with about 1 meter of overburden.

Copper.—Production of copper in ore and concentrate in Australia dropped about 13% below that of 1974. Similarly, output of blister copper was down 8%, compared with that of 1974. Four of Australia's major copper producers curtailed operations. Copper mining ceased at Tennant Creek, Northern Territory, for economic reasons in February, and at Mount Isa, Queensland, mine production was curtailed early in 1975 because of reduced market demand and lower copper prices. Mine output at Mount Lyell, Tasmania, declined because of difficult underground conditions and the collapse of a waste-ore pass, and at Mount Morgan, Queensland, a major slide of ground in November restricted output.

Production by the principal copper companies in 1973–75 is shown in table 4.

Mount Isa Mines Ltd. (MIM) reported that copper ore treated for the year ending June 30, 1975, amounted to 4.95 million tons, 7% below the 1974 level. There were no serious interruptions in production during 1975, contrasting with 1974 when serious flooding in North Queensland caused reduction in operations for several weeks. In the second half of the year, the copper ore mining rate was temporarily adjusted to permit the drawdown of previously accumulated concentrate stocks to a more normal level. Approximately 90% of the copper ore was mined from the No. 1,100 ore body. Production from the No. 400 ore body, which began in 1969 and has yielded 2.8 million tons of ore, was completed. One of two new ventilation shafts under development was completed and commissioned. This resulted in improved working conditions in the southern part of the No. 1,100 ore body. Reserves of primary ore on June 30, 1975, were reported at 140 million tons with an average grade of 3.0% copper. Secondary ore reserves were 1.5 million tons containing 3.8% copper.

Mount Lyell Mining & Railway Co. Ltd. produced 23,240 tons of copper in concentrate at its Queenstown mine, Tasmania, nearly 100 tons less than in 1974. The proportion of ore produced from underground sources amounted to 90% of total production. Most of the underground ore was recovered from the Prince Lyell and Cape Horn sections. Overall ore production was 2,303,700 tons, 43,200 tons less than that of 1974, due mainly to production difficulties in the Prince Lyell, Royal Tharsis, and Crown Three stopes. Delays in the mining of these sections deferred the full transition to underground mining for about 2 years. Exploration drilling continued within the Queenstown mining lease throughout the year, and ore reserves were put at 30 million tons of 1.48% copper.

Peko-Wallsend Ltd. ceased copper production at Tennant Creek, Northern Territory, early in 1975. Production at the group of mines operated by Peko-Wallsend up to curtailment of operation was as follows: Peko mine—66,200 tons of ore treated (2,183 tons of copper); Werrego mine—304,000 tons of ore treated (6,173 tons of copper); Orando mine—5,815 tons of ore treated (303 tons of copper); and Juno mine—60,100 tons of ore treated (259 tons of copper). The flash furnace performed satisfactorily, but the decline in the price of copper and sharp increases in the cost of fuel made the operation uneconomical. Prior to closure, research work was directed at separation of copper and bismuth in concentrate form.

Cobar Mines Pty. Ltd., located 720 kilometers from the New South Wales coast, treated 604,500 tons of copper ore averaging 1.9% copper. About 70% of the ore was mined by mechanized cut-and-fill stoping, the remainder being obtained from open stopes and from development carried out in ore. Concentrates were shipped to Port Kembla, New South Wales, for smelting and refining.

Kanmantoo Mines Ltd. in Kanmantoo, South Australia, was managed by Broken Hill South Ltd. Crude ore treated during 1975 totaled 877,200 tons. The 29,700 tons of copper concentrate produced contained 6,011 tons of copper.

Gunpowder Copper Ltd. increased output at the Mammount mine in Queensland, in line with the current expansion program. The Mount Gunson project in South Australia operated by CSR Ltd. and United Uranium N.L. continued to expand, becoming the fifth-largest producer in its first full year of operation, with an output of over 9,000 tons of copper in concentrates.

Table 4.—Australia: Major copper industry facilities

Facility	Production (metric tons of copper)[1]		
	1973	1974	1975
Mine:			
Mount Isa Mines Ltd	118,110	152,510	150,112
Mount Morgan Ltd	8,488	9,587	8,241
Cobar Mines Pty. Ltd	8,255	8,720	9,713
Mount Lyell Mining & Railway Co. Ltd	22,532	23,331	23,240
Electrolytic Zinc Co. of Australasia Ltd	1,262	1,845	1,278
Tennant Creek Field	8,092	14,773	14,525
Smelters:[2]			
Mount Isa Mines Ltd	118,227	130,805	160,525
Mount Morgan Ltd	8,140	9,100	9,900
Electrolytic Refining & Smelting Co. of Australia Pty. Ltd.[3]	8,980	10,212	9,306
Refineries:[4]			
Mount Isa Mines Ltd	118,227	130,805	148,370
Electrolytic Refining & Smelting Co. of Australia Pty. Ltd	24,240	28,340	26,280

[1] Metal content of ore.
[2] Primary blister copper.
[3] Treats concentrates from Cobar Mines Pty. Ltd.
[4] Primary electrolytic copper.

Gold.—Australia's gold industry in 1975 reversed the downward trend in mine production of the past several years and output increased slightly compared with that of 1974. With the high gold price in 1975, mining of and exploration for gold increased, and many new claims were staked. Another feature of the gold industry was the attention given to the retreatment of tailings dumps. In addition to increased output by most existing producers, some contribution was also made by the reopening of old mines. Lack of production from any major new mine indicated the reluctance of companies to undertake the large capital expenditure necessary to bring new mines into production because of uncertainty regarding future trends in the price of gold.

Western Australia remained the principal gold-producing State, and most of the output came from Kalgoorlie, Norseman, and Mount Magnet. Kalgoorlie Lake View Pty. Ltd., formed when Gold Mines of Kalgoorlie and Lake View & Star amalgamated their Kalgoorlie operations in 1973, was becoming the dominant gold producer in Australia. Kalgoorlie Lake View produced 162,080 troy ounces of gold from its Fimiston and Mount Charlotte mines and several open pits. The company's proven ore reserves as of June 1975 were 4.5 million tons containing 0.19 troy ounce of gold per ton.

Most of the Northern Territory's gold production came from the Tennant Creek District where Peko-Wallsend Ltd. produced copper-gold ore and copper-gold-bismuth ore from its Juno, Peko, Orlando, and Warrego mines. In 1975, these mines produced 137,215 troy ounces of gold, of which the gold-rich Juno ore body (80,000 tons of ore containing 1.6 troy ounces of gold per ton as of June 1974) produced 94,500 troy ounces of gold, compared with 159,400 troy ounces in 1974. The imminent exhaustion of this ore body was expected to lower gold production to a great extent as the Warrego "gold pod," to be mined separately from the Warrego ore body, contained 830,000 tons of ore averaging 1 troy ounce of gold per ton.

Metramar Minerals Ltd. and Australian Anglo American Ltd. began redeveloping the Blue Spec gold-antimony mine near Nullagine in the Pillbara region, Western Australia. Reserves were put at 80,000 tons of ore, averaging 1.4 troy ounces of gold per ton. Production was expected to commence in 1976, and a production life of 28 months was planned. Redevelopment work also took place at the Marvel Loch mine, south of Southern Cross in the Yilgarn goldfield, Western Australia. The project was a joint venture of Kia Ora Gold Corp. (60%) and Uranium and Nickel Exploration N.L. (40%). Lennard Oil N.L. commenced treating about 20 million tons of tailings it controlled at Lancefield and Leonara in the Eastern goldfields. Treatment of about 25 tons of tailings was expected to produce 1 troy ounce of gold. At Coolgardie, Western Australia, Roeburne Exploration and Mining

Ltd. expected to recover up to 15,000 troy ounces of gold per year from the working of gold-bearing alluvials. The treatment plant started operations late in 1974. Newmont Pty., Ltd., a subsidiary of Newmont Mining Corp. of the United States, outlined a significant ore body east of Marble Bar in the Great Sandy Desert, Western Australia. Ore reserves were estimated at 3.8 million tons averaging 0.3 troy ounce of gold per ton. The open pit mine was scheduled to be commissioned in 1976. The principal gold producers and quantities recovered during 1975 were as follows:

Company	Gold produced (troy ounces)
Central Norseman Gold Corp. N.L.	29,820
Golden Plateau N.L	16,532
Kalgoorlie-Lake View Pty. Ltd	110,212
Hill 50 Gold Mine N.L	8,210
Mount Lyell Mining & Railway Co. Ltd	15,448
North Kalgurli (1912), Ltd	1,928
Peko-Wallsend Ltd	183,791

Iron and Steel.—Despite reduced demand for iron and steel products and a high level of industrial dispute, the industry advanced on all fronts in 1975. Output of both iron ore and pig iron was slightly greater than that of 1974. The increase in iron ore output resulted mainly from additional production facilities commissioned at Pilbara during 1974 and 1975. The depressed world demand for steel led to reduced shipments to Japan, but the policy of steelmakers to rebuild or increase stocks rather than retract purchase commitments assisted in maintaining a high level of production in 1975.

The Broken Hill Pty. Co. Ltd. (BHP) increased production of raw steel to 8.0 million tons, 4% above that in 1974. A 5% reduction in output to 2.7 million tons at Newcastle was offset by increases to 1.8 million tons at Whyalla and 3.5 million tons at Port Kembla, New South Wales. Production of structural, flat, and sheet products was maintained at Whyalla and Port Kembla owing to increased export sales despite substantially reduced domestic demand.

Exports of iron ore and iron ore pellets decreased 4% to 80 million tons in 1975. Australia's iron ore producers searched the world for contracts to provide the basis for expansion and new development. Although Japan remained the principal destination of exports (62 million tons or 77% of the total), the most notable feature was the increasing rise in exports to other destinations. Substantial increases occurred in exports to West Germany, the People's Republic of China, Greece, France, and the Republic of Korea. The rapid development of the Republic of Korea's shipbuilding, vehicle, and heavy machinery industries was the major factor causing the growth in that country's steel industry.

In April 1975, iron-ore-producing countries met in Geneva and approved the text of an agreement to establish an association to be known as the Association of Iron Ore Exporting Countries. Ministers from Algeria, Australia, Chile, India, Mauritania, Peru, Sierra Leone, and Venezuela attended the meeting. Representatives of Brazil and Liberia also participated while Canada, the Philippines, and Tunisia attended as observers. The basic objective of the proposed association was to provide a forum for exchange of information and discussion of mutual problems.

The principal Australian iron ore producers and their output in 1975 were as follows, in thousand tons:

Company and location	Quantity
Goldsworthy Mining Ltd., Western Australia (lump)	8,058
Hammersley Iron Pty. Ltd., Western Australia (lump, pellets)	36,107
Western Mining Corp. Ltd. (WMC), Western Australia (lump)	697
The Broken Hill Pty. Co. Ltd. (BHP), Western Australia (lump)	3,200
The Broken Hill Pty. Co. Ltd. (BHP), South Australia (lump, pellets)	7,600
Savage River Mines, Tasmania (pellets)	2,190
Frances Creek Iron Mining Corp. Ltd., Northern Territory (lump)	570
Mount Newman Iron Ore Co., Western Australia (lump)	33,242

The two mines operated by Hamersley Iron (Mount Tom Price and Paraburdoo) produced 5% more iron ore in 1975 than in 1974. The higher production rate reflected the delivery of new mining equipment, the completion of part of the plant-upgrading program at Mount Tom Price, and improved industrial relations. Recovery of salable ore from material mined rose from 49% to 51%. Total salable production at the Mount Tom Price mine increased 13.3% to 22.3 million tons, consisting of 14.3 million tons of high-grade lump ore, 7.2 million tons of high-grade fines, and 822,000 tons of low-grade fines. Total material (ore and waste) moved at the mine was 39.9 million tons. New mining equipment commissioned during 1975 included two large blast-hole drills, three 9.3-cubic-meter-capacity electric shovels, one large front-end loader (7.7-cubic-meter-capacity bucket), and two heavyweight graders. This new equipment contributed to increased productivity. Salable ore production at Paraburdoo in 1975 was 13.8 million tons compared with 14.6 million tons in 1974. Production in 1975 consisted of 7.1 million tons of high-grade fines and 92,000 tons of low-grade fines.

A major geological survey program was carried out at both the Mount Tom Price and Paraburdoo pits. This program established the presence of significant mineralization at the eastern and southern flanks of Mount Tom Price. At Paraburdoo, a drilling program to enable a more accurate interpretation of the complex Paraburdoo ore body was being actively pursued.

Production by the Mount Newman consortium, a joint venture operated by Mount Newman Mining Co. Pty. Ltd., was 15% higher than that of 1974. Of this total, 29.4 million tons was exported and 3.8 million tons was shipped to the domestic steel industry. With the addition of 4 new 17-cubic-meter electric shovels and 16 new Wabco Haulpak trucks, mining and ore hauling capacity was raised about 20%. In mid-year, the consortium announced that a further expansion had been authorized to raise capacity to 40.6 million tons per year by early 1976. Goldsworthy Mining Ltd. iron ore production dropped by 7.5 million tons, 12% below the 1974 total. The decline in production was attributed to industrial disputes and a 15% drop in requirements by the Japanese steel mills.

BHP and its wholly-owned subsidiaries continued to increase production of iron ore and steel during 1975. Iron ore production by the company's various operations, including Dampier Mining Co.'s share of the Mount Newman production (10.9 million tons), increased 7% over last year to 21.7 million tons. Relatively large increases at BHP's Yampi Sound mine were achieved to meet temporarily high export requirements.

BHP's combined production of raw steel increased 4% to a new record level of 8.0 million tons. Production would have been higher, except for industrial disputes at the Port Kembla, Newcastle Plant, and in the maritime industries. Shortages of coal, due to labor problems affecting shipping operations, affected iron production at Whyalla, South Australia. Major repairs were carried out on 6 of the company's 12 blast furnaces. The No. 1 furnace at Port Kembla remained off-line after its repair in December because of inadequate iron ore supplies brought about by industrial disruption in maritime operations. The Kwinana blast furnace, in Western Australia, was shut down for relining early in the period but then operated regularly and produced principally for the export market. The BHP consolidated annual reports for periods ending May 31, 1974, and May 31, 1975, summarize output of various products as follows, in thousand tons:

Commodity	Quantity	
	1974	1975
Pig iron	7,551	7,540
Steel ingots and billets	7,705	8,017
Blooms and slabs	6,434	6,568
Sheets, bars, billets, etc	3,123	3,218
Plate and strip	2,751	2,533
Merchant	1,730	1,585
Rod	578	565
Narrow cold-rolled strip	96	68
Tinplate	243	317

Lead and Zinc.—Mine production of lead increased to around 8% in 1975, mainly because of a marked improvement in output by Australian Mining & Smelting Ltd. (AM&S) at the Broken Hill mines in New South Wales. Mine production of zinc increased 45,571 tons owing to increased output at Mount Isa and Broken Hill mines operated by AM&S. However, production of both refined lead and zinc declined in 1975. Refined lead production was off 17% because of output reductions by Broken Hill Associated Smelters Pty. Ltd. (BHAS), the principal Australian refinery. Production of lead bullion was up 5% despite the closure of the Sulphide Corp. Pty. Ltd. plant at Cockle Creek, New South Wales, late in 1975 for maintenance. Refined zinc output totaled some 193,335 tons, compared with 276,831 tons in 1974. A series of cutbacks was announced by domestic zinc refineries late in 1974 and in 1975. Domestic concentrate stocks increased substantially in the second half of 1975 because of reduced export demand and lower demand by domestic smelters and refineries. Several producers announced intentions to stockpile unsold concentrate rather than reduce mine output. Domestic lead consumption was unchanged in 1975, but zinc consumption was about 81,000 tons, or 33%, less than in 1974.

MIM again played a significant part in Australia's lead and zinc output. Lead production in 1975 was 131,700 tons, most of which was exported to the Britannia Lead Co.'s refinery in the United Kingdom. Zinc production totaled 115,200 contained tons, and again most of it was exported as concentrate. Traditionally, this material was shipped to ASARCO, Inc. (MIM's parent company) in Amarillo, Tex., but severe pollution control requirements, which caused the Amarillo smelter to close down, forced more zinc concentrates to be sold on the free market. Reports from Japan suggested that about 30,000 tons per year would be toll-refined there in 1975–78. New MIM projects included the lead-zinc mine at Hilton, Queensland, which could come onstream around 1985. Exploration drilling continued and bulk ore samples were obtained for pilot plant metallurgical testing. Progress was made in establishing the basic techniques for treating Hilton ore, which was finer textured than the Mount Isa ore. Reserves of silver-lead-zinc ores in the Mount Isa and Hilton mines were 51 million and 37 million tons, respectively. A feasibility study continued on the establishment of a zinc refinery and associated facilities at Townsville, Queensland. A feasibility study on production of zinc oxide from lead smelter slags at Mount Isa was also undertaken.

At the McArthur River deposit, Northern Territory, an adit was being driven to obtain ore samples, and a pilot plant was being constructed. The extremely fine-grained nature of the sulfide minerals discouraged mine development, as normal flotation methods of separation could not be used. Reserves of the main deposit were estimated to be 190 million tons (9.5% zinc, 4.1% lead, and 1.4 troy ounces of silver per ton), but additional reserves were believed to exist in the area. MIM expected to spend $6 million over the next 2 years on metallurgical and other investigations. A 50-ton-per-day pilot concentration plant was built to determine whether the deposit is a commercially viable proposition.

Mine output by Zinc Corp. Ltd. and New Broken Hill Consolidated (NBHC), operated by AM&S at Broken Hill, New South Wales, was above the 1974 level. Increased emphasis was placed on mine development. AM&S increased contained zinc output from 176,629 to 205,197 tons in 1975. Ore recovered from the group's two mines at Broken Hill increased from 1.64 million to 1.84 million tons. The average grades of ore treated remained constant throughout the period at 9.3% lead, 2 troy ounces of silver per ton. and 12% zinc. Contained lead production for the year increased from 192,226 to 213,492 tons. Industrial relations were much improved in 1975.

AM&S agreed in principal with Phelps Dodge Corp. and St. Joe Minerals Corp. of the United States to develop the Woodlawn ore deposit in New South Wales. Detailed engineering studies of the deposit, located about 45 miles north of Canberra, were completed. Proven ore reserves were 10 million tons averaging 3% lead, 7.5% zinc, 1.5% copper, and 1.5 troy ounces of silver per ton. Development of the open pit zinc, lead, copper, and silver mine was expected to cost about $100 million, the first $23.3 million to be paid by AM&S and the balance financed equally by the three partners. Ownership was to be divided evenly among the three partners. The partners were also to share equally in an exploration program within a 32-kilometer radius of the deposit. Drilling in the area was being managed by Jododex Australia Pty. Ltd., which was owned 50% by St. Joe and 50% by Phelps Dodge.

Production of zinc metal at the Sulfide Corp. smelter at Cockle Creek, New South Wales, was limited to 65% of plant capacity for most of the year, while lead bullion production was about 80% of capacity. The smelter was shut down in November to conduct regular maintenance and to avoid an excessive buildup of metal stocks. Smelting operations were expected to be resumed early in 1976. Two new process developments that should lead to greater operating efficiency were successfully tested during the year. Improved control over liquid effluents and gaseous emissions was also achieved following the installation of new facilities costing $2.4 million.

Electrolytic Zinc (EZ) Co. of Australasia, Ltd., the major subsidiary of E.Z. Industries Ltd., operated three mines in the Read-Rosebery area of western Tasmania. The company also operated the Risdon refinery. Ore output from the company's Rosebery, Farrell, and Hercules mines totaled 505,191 tons, most of which came from the Rosebery mine. Ore output was 4% lower than that for 1974, primarily due

Table 5.—Australia: Lead-zinc production, by major company
(Metric tons)

Company	1973 Lead	1973 Zinc	1974 Lead	1974 Zinc	1975 Lead	1975 Zinc
North Broken Hill Ltd	63,364	46,313	58,383	46,922	57,192	39,308
The Zinc Corp. Ltd	82,860	60,900	74,850	62,800	78,950	88,700
New Broken Hill Consolidated Ltd. (NBHC)	82,140	138,100	71,150	114,200	83,120	116,300
Mount Isa Mines Ltd	112,510	102,754	124,381	103,051	131,689	115,209
Electrolytic Zinc Co. of Australasia Ltd. (Read-Rosebery)	26,290	75,894	26,311	76,777	18,162	60,801

to the effects of continuing labor shortages and a high turnover and absentee rate. Where possible, production was maximized at the Rosebery mine. The Hercules mine was operated on a single shift basis throughout the year, and the Farrell mine was temporarily closed. The supply of zinc concentrate was also temporarily interrupted by the loss of 9,700 dry tons in January, when an ore vessel, the *Lake Illawarra,* sank after colliding with the Tasman Bridge. The No. 6 fluid roaster for zinc concentrate, the largest of its type in the world, commenced operation in June after some initial difficulties with ancillary equipment. Four flash roasters were thereby superseded after giving good service dating back to 1948.

Manganese.—Australia's manganese production decreased 6% compared with that of 1974. The decline was attributed to Groote Eylandt Mining Co. Pty. Ltd., a subsidiary of BHP, where production was down 7% following industrial disputes. Output at the Groote Eylandt plant, located in the Northern Territory, accounted for over 90% of Australia's total production in 1975. A capital expenditure program of $20 million by Groote Eylandt to increase production capacity from 1.3 million to 2 million tons per year was nearing completion at yearend. The explansion included modifications of the concentrator, and increases in production handling, power generation, and general transport capacities.

A shortage of manganese ore developed early in 1975 as a result of sustained demand from the world steel industry during the preceding 2 years. Tight supplies, cost increases, increased freight rates, and currency fluctuations caused substantial increases in the price of ore scheduled for delivery during 1975. The average price for high-grade lump ore from Groote Eylandt for sale to the United States during 1975 increased from $28.99 per ton in 1974 to $38.70 per ton f.o.b. No domestic price was quoted for manganese ore. Metallurgical-grade ore for local ferroalloy production was produced and consumed by subsidiary companies of BHP. Most of the ore for export was sold on a contract basis at prices negotiated annually.

The $29 million manganese expansion program by Tasmanian Electro Metallurgical Co. Ltd. of Tasmania was expected to be completed by yearend 1975. Major items to have been installed were a 24,000-kilovolt-ampere electric furnace to provide additional production capacity for manganese alloys, a sinter machine to process manganese ore feed, and a 39,000-kilovolt-ampere furnace for the manufacture of ferrosilicon. The existing plant at Bell Bay used for producing ferromanganese and silicomanganese consisted of two electric furnaces rated at 13,400 to 16,000 kilovolt-amperes.

Nickel.—The domestic nickel industry was characterized by rapid expansion and increased output in 1975. As a result of high production from the Greenvale mine in Queensland and the Windarra, Spargoville, and Redross mines in Western Australia, total mine production reached 75,000 tons, 61% above the 1974 level. Production would have been higher except for decreased output from the Great Boulder, Scotia, and Carr Boyd mines, in Western Australia. Several new mines experienced difficulties which prevented them from achieving planned production rates. Producers increased their quoted nickel prices from $2.01 to $2.20 per pound during the year, to match those announced by International Nickel Co. in 1975. The new prices did not apply to sales previously contracted until yearend 1976 and only applied to some new spot sales during the last quarter of 1975. Output by Western

Mining Corp. Ltd. (WMC), which produced about two-thirds of Australia's nickel, was 43,767 tons. Ore treated at the Kalgoorlie smelter, Western Australia, reached 1.4 million tons containing 2.92% nickel. Smelter capacity was increased during the year through the installation of an oxygen plant to enrich the furnace air. The installation of additional equipment to achieve a feed rate of 350,000 tons of concentrate per year was nearing completion at yearend.

The WMC's nickel refinery continued to operate at a high level of efficiency. Plant modifications and new equipment installation to lift capacity to 30,000 tons per year continued. A production rate of approximately 24,000 tons per year was reached by yearend.

Metals Exploration N.L. and Freeport of Australia Inc. were equal partners in Queensland Nickel Pty. Ltd., which was formed to mine and process ore from a large lateritic deposit of weathered serpentine at Greensvale, northern Queensland. Open pit mining commenced in 1974, with output being railed 216 kilometers to a new treatment plant at Yabulu, about 24 kilometers north of Townsville, Queensland. This project represented the only commercial production of nickel from a lateritic deposit in Australia. This $260 million plant had a rated capacity of 25 million tons per year. Reserves were estimated at 45 million tons of lateritic ore averaging 1.57% nickel and 0.12% cobalt.

Development work on the large nickel deposit at Agnew, Western Australia, proceeded as scheduled. Partners in the development were Western Selcast Pty. Ltd. and MIM Holdings Ltd. Reserves totaled 47 million tons of ore, containing 2% nickel and a side deposit of 1.5 million tons, averaging 4% nickel. The large low-grade deposit was a vertical cylinder close to a sloping layer of higher grade ore. The first-stage operation, scheduled for 1978, was to concentrate on the high return extraction of the sloping layer to produce 10,000 tons per year in a 12% nickel concentrate before a final decision was made to continue with large tonnage extraction of the lower grade reserves. A concentrating plant and flash smelter were to be constructed at the mine site.

Anaconda Australia Inc., a subsidiary of the U.S.-based The Anaconda Co., held a 60% interest in a joint venture with Conzinc Riotinto (26⅔%) and AM&S (13⅓%), which controlled nickel deposits at Redross. Widgiemooltha, and Wannaway, south of Kalgoorlie, Western Australia. The company treated 182,000 tons of ore, producing 6,300 tons of nickel in 1975. Reserves at Redross were about 1 million tons with an average nickel content of 3.5%. Endeavour Oil Co. N.L. announced additional intersections of nickel sulfide mineralization at its Digger Rocks prospect at Forrestania, Western Australia, which was jointly owned by AMAX (70%) and Endeavour (30%). The most recent estimate placed probable ore reserves at Digger Rocks at 3 million tons averaging 1.11% nickel, with possible reserves of 1 million tons averaging 0.94% nickel. These reserves are minable by open pit, but further reserves were known to exist at greater depth. At the more southernly ore body, probable reserves were 2.16 million tons averaging 1.45% nickel.

Silver.—Domestic production of silver in 1975 increased 9% because of an increase in output of lead-zinc ores. Most of the silver produced was won as a byproduct of lead-zinc mining operations at Mount Isa, Broken Hill, and Rosebery in Tasmania. The metal was also produced as a byproduct of gold and copper mining at other locations in Australia. Mount Isa Mines Ltd. was the largest domestic mine producer. In 1975, 2.5 million tons of lead-zinc ore averaging 5 troy ounces of silver per ton of ore were milled to yield over 11 million troy ounces of silver. Silver was also produced as a byproduct of copper-lead-zinc mining at Mount Isa. All lead concentrate was smelted at the mine site to lead bullion, which was exported to the United Kingdom for refining and extraction of the contained silver. The zinc concentrate was exported, and silver contained in the copper concentrate was recovered at the Townsville electrolytic copper refinery as anode slimes. Electrolytic Refining & Smelting Company of Australia Pty. Ltd. recovered about 1.6 million troy ounces of silver from Cobar and Mount Lyell copper concentrates, tankhouse slimes from the electrolytic copper refinery at Townsville, mint sweepings, jewellers scrap and scrap copper.

Total production of silver at Broken Hill continued a downward trend because an increasing proportion of ore was being mined from the zinc-rich lodes; these lodes averaged about 3 troy ounces of silver per ton, compared with about 7 troy ounces per ton for the lead-rich lodes. Most of the silver produced at Broken Hill was contained in lead concentrates, which were treated at BHAS's lead refinery at Port Pirie in South Australia. Silver was mined at Rosebery in Tasmania as a byproduct of copper-lead-zinc mining operations conducted by the EZ Co. In 1975, the company treated 505,200 tons of ore averaging 6 troy ounces of silver per ton and produced 2.4 million troy ounces of silver.

Principal producers of silver and output, in thousand troy ounces, during 1974 and 1975 were as follows:

Commodity	Quantity	
	1974	1975
North Broken Hill Ltd	3,140	2,925
Zinc Corp. Ltd	1,936	1,753
New Broken Hill Consolidated Ltd	1,424	1,559
Mount Isa Mines Ltd	8,896	11,008
Electrolytic Zinc Co. of Australasia Ltd	2,571	2,468

Tin.—The downward trend in domestic production of tin-in-concentrate continued in 1975 when production was 8% lower than that in 1974. Smelter production of primary refined tin decreased more than 21% from that of 1974. Output was affected by continued low domestic consumption, and, for a portion of the year, by export controls imposed by the International Tin Council (ITC). The ITC, of which Australia was a producer member, imposed restrictions on exports from April to July. This had the effect of reducing exports from Australia approximately 18% for that period. In addition, domestic consumption was substantially below that of previous quarters so that the effect on sales was a curtailment of approximately 30% during the period of restrictions.

The largest tin producer in Australia, Renison Ltd., in 1975 treated 459,646 tons of ore and 6,368 tons of high-grade concentrate and 3,105 tons of low-grade concentrate at its plant in Tasmania. Concentrator throughput increased by 63,805 tons compared with 1974, but the head grade was down to 1.25% tin compared with 1.46% tin for the previous year. Overall recovery of tin metal in concentrates was 68.8% compared with 69.2% in 1974. Tin metal in concentrates was 3,910 tons, 41 tons lower than that of 1974. Construction of a heavy-media separation plant was completed in December 1974 and commissioned in January 1975. Combined proved and probable reserves decreased 247,400 tons after allowing for depletion by mining, but the proved reserves increased by 1 million tons.

Cleveland Tin N.L. produced tin and copper from its mine at Luina in northwest Tasmania. Some 325,120 tons of ore, with head grades of 0.75% tin and 0.25% copper, were treated to produce 1,270 tons of tin-in-tin concentrate and 71 tons of tin-in-copper concentrate. The increasing proportion of mined ore containing finer grained tin led to treatment problems and a 4.5% decline in recovery of tin. Indicated ore reserves totaled some 2.6 million tons averaging 0.8% cassiterite and 0.4% copper.

Ardlethan Tin N.L. milled 456,708 tons of ore with a head grade of 0.57% tin. Tin metal in concentrate produced was 1,310 tons, representing an average recovery of 62%. All mining during the year was from the Ardlethan West pit. Minable reserves totaled 2.5 million tons of indicated ore with an estimated average grade of 0.62% tin.

The following tabulation summarizes production of tin-in-concentrate from the principal tin producers in 1974 and 1975, in tons:

Company	Quantity	
	1974	1975
Alberfoyle Tin Co. N.L	427	412
Ardlethan Tin N.L	1,519	1,310
Cleveland Tin N.L	1,494	1,270
Gibsonvale Alluvials, N.L	447	352
Greenbushes Tin N.L	706	438
Loloma Ltd	113	343
Metals Exploration N.L	185	205
Ravenshoe Tin Dredging Ltd	498	254
Renison Ltd	3,951	3,910
Tableland Tin Dredging N.L	425	409

Titanium Concentrates.—While the domestic production of mineral sand concentrates was 7% over that of 1974, the large increases previously predicted did not materialize. The attractive market and record prices for mineral sands of 1974 were replaced in 1975 by oversupply, reduced demand, and weakening prices. The overall economic recession and its adverse effects, particularly on the pigment and steel industries, resulted in the deferment and, in some cases, cancellation of deliveries of mineral concentrates. Domestic producers postponed some expansion programs and cut their levels of output. Also, some new projects did not meet construction schedule deadlines nor achieve rated production capacities.

In February, the Western Australia Minister for Mines issued a statement which included a new estimate of reserves in the State, totaling 72.9 million tons of heavy sands. Geographically, 33.7 million tons were in the Eneabba District, 29.5 million tons in the Capel District, and 9.7 million tons at other scattered locations. The total included 46.9 million tons of ilmenite, 3.5 million tons of rutile, 9.8 million tons of zircon, and 12.7 million tons of other minerals.

In the Capel District, producers included Western Titanium Ltd., Westralian Sands Ltd., Cable Sands Pty. Ltd., Western Mineral Sands Pty. Ltd., and Mid-East Minerals. In the Eneabba District, Jennings Mining Ltd. and Allied Eneabba Pty. Ltd. came into full production during the last half of 1975, Western Titanium was building a plant to begin operation in 1976, and a fourth company, Ilmenite Pty. Ltd., while holding mineral lands, was inactive. At Jurien Bay, WMC Mineral Sands engaged in shakedown operations of its new plant. The joint venture of Westralian Sands and Lennard Oil N.L. at Gingin was inactive pending market improvement.

Western Titanium's new plant in the Eneabba area was expected to be in full production early in 1977, and then was to produce 150,000 tons of ilmenite, 30,000 tons of rutile, and 70,000 tons of zircon per year. The company was 85% owned by Consolidated Gold Fields of Australia.

In 1974, Westralian Sands introduced a new product, HYTI 68, an ilmenite-leucoxene concentrate containing 68% TiO_2.

Jennings Mining Ltd. reached capacity production about midyear, after some early difficulties. Annual production of 40,000 tons of rutile, 160,000 tons of ilmenite, and 30,000 tons of zircon was scheduled.

Allied Eneabba, owned 25% by E. I. Du-Pont de Nemours & Co., Inc., began operations in August. Reserves were estimated at 7.75 million tons proven and 27.73 million tons of probable sands. Fluor Australia Pty. Ltd. contracted for plant construction and housing.

Late in 1974, Western Mining Corp. exercised its option on the Jurien Bay heavy mineral deposit owned by Black Sands Ltd. and began building a mining and concentrating plant. The company, jointly with Mitsubishi Chemical Industries, was also considering construction of a synthetic rutile plant at the mine site.

Western Titanium produced 31,689 tons of synthetic rutile at its new 35,000-ton plant in its 1974 fiscal year. The company closed its older 13,400-ton plant because of weakening demand, rising costs, and delayed official approval for exports. The plant had produced 10,345 tons of synthetic rutile in its 1974 fiscal year.

Rutile and Zircon Mines (Newcastle) Ltd. announced a joint feasibility study with Akzo Zout Chemie of the Netherlands for upgrading ilmenite by a new high-temperature chlorination process. A pilot plant at Mt. Morgan, Queensland, was to be used.

DM Minerals, a joint venture of Murphyores Ltd. and Dillingham Corp. of Australia Ltd., began operation of its mining plant on Fraser Island, offshore Queensland, during the year. Environmental groups, to some extent supported by the Australian Government, continued to oppose the mining operation.

Uranium.—There had been no mining of uranium in Australia since 1964. Work started on the rehabilitation of the Mary Kathleen mine in Queensland early in 1975, and mining was expected to resume in mid-1976. Development and construction plans for a new mine and plant at the Ranger prospect in the Northern Territory were announced in 1974. This construction was to be subject to the completion of an environmental impact inquiry which commenced during the year. The proposed mill at Ranger was to have a designed capacity of about 2,540 tons of uranium per year. Initial production was planned for 1979.

The Mary Kathleen mine, closed since 1963, was to supply contracts calling for the delivery of 4,740 tons of U_3O_8. The first delivery was to be made in late 1976. The production rate was expected to be about 900 tons of U_3O_8 per year. Mary Kathleen Uranium Ltd. issued shares, underwritten by the Australian Government, to raise $17 million for the redevelopment. The shares were not fully subscribed to, which resulted in the Australian Atomic Energy Commission obtaining a 41.6% interest in the company, with CRA retaining its original 51% interest. The open pit mine had estimated reserves of 7.700 tons of U_3O_8.

Exploration work in recent years has proven large reserves of uranium in Australia. The Alligator River area, Northern Territory, has emerged as a major world uranium province. Four major deposits located in the area were Jabiluka, Ranger, Nabarlek, and Koongarra. Other deposits of significance were found in the Westmoreland area in Queensland, Lake Frome in South Australia, and Yeelirrie in Western Australia. Australia's reasonably assured reserves, of recoverable uranium at less than $30 per pound, were estimated at 430,000 tons U_3O_8.

NONMETALS

Phosphate Rock.—Phosphate rock production commenced in northwest Queensland during the year. The operating company, Queensland Phosphate Pty. Ltd., a wholly-owned subsidiary of Broken Hill South Ltd. (BH South), announced that in the initial development of the mining area at Duchess, 700,000 cubic meters of overburden had been removed to expose 50,000 tons of phosphate rock, 10,000 tons of which was mined and stockpiled. A crushing and screening plant was also commissioned. The product was hauled by road to Duchess for railing to Townsville, Queensland. An agreement was concluded with Queensland Railways for the rail line to be extended to the plant site. Orders for rolling stock placed by Queensland Railways included 11 locomotives and 270 cars, which were considered sufficient for the initial planned production rate of 1 million tons per year. The company anticipated an increase in production rate to 3 million tons per year by yearend 1977.

Prior to production, full-scale plant tests for the manufacture of superphosphate were arranged by the Australian Fertilizers Manufacturers Committee. Pilot plant tests were also carried out by Australian Fertilizers Ltd. for the manufacture of phosphoric acid using the dihydrate and hemihydrate/dihydrate processes. Results of these tests confirmed the suitability of the Duchess rock for this purpose. There was a strong demand for phosphates in southeast Asia and Australasia, and BH South planned to sell any surplus output under long-term contracts. Discussions were also continued with the Australian Government on exporting phosphate not required for the Australian market.

Total reserves exceeded 2 billion tons of phosphate rock grading 17.5% P_2O_5, of which approximately one-third lie in a northern and central group of deposits. The remainder, some 1.3 billion tons, was mainly at the Duchess deposit in the Cloncurry District, about 230 kilometers south of Lady Annie. The Duchess deposits consist of three main zones of measured reserves. The phosphate Hill zone in the south contained 315 million tons of 18.3% P_2O_5. Within this zone, 40 million tons with a grade in excess of 31% P_2O_5 can be classed as direct shipping rock.

Australian phosphate rock was to be supplied to the Republic of Korea under a 5-year, $15 million contract negotiated by Gollin Ltd. The rock was to be exported from BH South's deposit at a rate of 40,000 tons the first year, increasing to 100,000 tons per year by the end of the contract.

Salt.—Australia's salt production of 5 million tons in 1975 was 1% higher than the 1974 output of 4.9 million tons. Most of the production (84%) came from Western Australia and virtually all was exported, mainly to Japan. Ideal conditions exist in the State for the production of salt by solar evaporation of seawater, or by harvesting from naturally occurring brine in salt lakes. All domestic salt production was obtained by these processes.

Leslie Salt Co. at Port Hedland, Western Australia, reported a salt output of 1.04 million tons from 16 crystallizer ponds. Harvesting was a year-round operation performed on a 10- to 12-hour-shift basis, 5 days per week. The company reported that new markets were established in the Philippines and the Republic of South Africa; established markets in Japan, Korea, New Zealand, and Taiwan were also supplied. Production capacity was approximately 2 million tons per year.

Dampier Salt Ltd. reported a production of 1.5 million tons of salt from Mistaken Island, Western Australia, during 1975. Production was from 30 crystallizer ponds. The company reported that final plans were made to equip the salt field for an annual production capacity of 2.4 million tons. Texada Mines Pty. Ltd. reported salt production of 1.53 tons in 1975 from the company's plant at Cape Cuvier, 24 kilometers west of Lake McLeod, Western Australia. Approximately 4,446 acres of evaporation pans were constructed on the southern section of the lake, of which about 2,470 acres were used for sodium chloride production and the remainder for langbeinite ($K_2Mg_2(SO_4)_3$) production. Ownership of the operating company changed during the year. In 1974, C. Itoh & Co. acquired a one-third interest in Texada Mines through a transfer of shares from the U.S. parent company, Southern Cross Mines Ltd. C. Itoh increased its shareholding in 1975 to 80% through a second transfer of shares from Southern Cross. Lefroy Salt Pty. Ltd. produced 110,000 tons of salt from operations at Lake Lefroy, Western Australia, in 1975, compared with 94,365 tons in 1974. A large washing plant was installed during the year and plans were made to construct additional facilities to raise total washing capacity to 500,000 tons per year.

Sulfur.—Sulfur was one of the few minerals in short supply in Australia during 1975. Sulfur was consumed mainly as sulfuric acid to produce fertilizer, particularly superphosphate. There were no known deposits of elemental sulfur in Australia, and more than half of the total annual production of sulfuric acid in previous years came from imported brimstone. In 1975, about 70% of sulfuric acid production was from imported brimstone and 30% from indigenous raw materials, principally zinc, pyrite, and lead concentrates. Elemental sulfur was recovered from petroleum by Petroleum Refineries (Australia) Pty. Ltd. at Altona, Victoria, and Hallett's Cove, South Australia; Shell Chemical (Australia) Pty. Ltd. at Clyde, New South Wales, and Geelong, Victoria; Australian Oil Refining Pty. Ltd. at Kernell, New South Wales; and Amoco (Australia) Pty. Ltd. at Bulwer Island, Queensland. The combined capacity of the plants was about 52,000 tons per year of elemental sulfur.

Pyrite for sulfuric acid manufacture was produced only as a byproduct of base metal mining in Tasmania by EZ Co. and the Mount Lyell Mining & Railway Co. Ltd. The acid was produced at Burnie, Tasmania, by North-West Acid Pty. Ltd., a company jointly owned by the two pyrite-producing companies. Mount Lyell Mining & Railway Co. Ltd. reported production of 108,045 tons of pyrite concentrate and shipments to North-West Acid Ltd. of 105,659 tons of concentrate in 1975. EZ shipped 113,503 tons of concentrate, and acid production by North-West Acid in 1975 was estimated at about 200,986 tons.

MINERAL FUELS

Coal.—Australia's coal production (black coal, exclusive of lignite) increased 6% over the record output in 1974. The main contributions were from the Singleton-Northwest and Western Districts of New South Wales, where coal production increased 34% and 21%, respectively, and from the Bowen Basin in Queensland where Peak Downs mine, owned by the Utah Development Co. Ltd. (UDC), increased production 38%. UDC's new Saraji mine began operating at full capacity early in 1975. In terms of salable coal prepared for market, the Australian total was 66.9 million tons, of which 40.1 million tons came from New South Wales and 22.7 million tons from Queensland. About 60% of Australia's coal output was mined by open pit methods; the remainder came from underground mines.

Despite adverse factors, consumption of coal in Australia increased 9.1%, to 30 million tons during 1975. These factors were the reduced level of economic activity in many Australian industries, and industrial problems in the power-generating industry. There were no difficulties in supplying the types and qualities of coal required by some consumers. In Western Australia, Queensland, and New South Wales coal consumption increased sharply. In Victoria, an increase in consumption was attributed to lignite (brown coal).

Coal production in New South Wales increased sharply in 1975 in contrast to a reduction in 1974. The capacity of the industry in New South Wales increased as the number of employees rose and as previous plans to take advantage of expanding markets began yielding results. The plans were developed or accelerated following the oil crisis late in 1973. Raw coal production was 42.3 million tons, 5.7 million tons more than in 1974. Both underground mines and open pits contributed about equally to the improvement in 1975. There were 84 mines in production late in 1975. In addition, developmental work was proceeding at West Cliff, Macquarie, Tower, Cordeaux, and Tahmoor. Planning for several other projects was well advanced. BHP was the principal producer in New South Wales. The company operated four mines in the Newcastle District, while its subsidiary, Australian Iron and Steel Pty. Ltd., operated seven collieries in the Southern Coalfields.

The combined output of about 8 million tons of coal per year made BHP the largest producer of underground coal in Australia. Clutha Development Pty. Ltd. operated 12 coal mines in New South Wales. Eight underground mines were in the Burragorang Valley in the southern coalfields. and three open pit and one underground mine were in the Northwestern coalfield. Coal production from the 12 mines increased from 6.2 million tons in 1974 to 6.4 million tons in 1975.

The major coal producer in Queensland was UDC. UDC produced from rich beds in the Fitzroy River Basin and Bowen Basin in central Queensland. In 1975, UDC operated open pit coal mines at Blackwater, Goonyella, Peak Down, and Saraji. Feasibility studies were underway for a fifth pit, also in the Bowen Basin. The combined output from these operations totaled some 13.8 million tons in 1975. UDC also operated one of the world's largest port facilities for coal export. Through a subsidiary company, Hay Point Services Pty. Ltd., UDC exported about 12.5 million tons of high-quality coking coal, principally to Japan and Europe. Another major Queensland coal producer was Thiess Peabody Mitsui Coal Pty. Ltd. (TPM), which operated underground and open pit mines in the Kianga and Moura coalfields and supplied about 4 million tons of coking coal to Japan in 1975. Coal was also supplied to the domestic market.

Employment in the coal industry increased during 1975, and throughout the year there were few vacant positions in the mining districts. An increase of 1,284 workers lifted total coal industry employment in New South Wales to 14,988. This was the highest level since 1958.

Total measured and indicated reserves of coal in Australia, excluding lignite, were about 200 billion tons, mainly in New South Wales and Queensland. Efforts by nations to lessen dependence on Middle East crude oil for energy needs should ensure increasing development of these deposits. The Joint Coal Board reported output, by States, as follows, in thousand tons:

State	1973	1974	1975
Queensland	19,975	21,085	22,760
New South Wales	37,882	38,703	40,152
Tasmania	115	127	162
South Australia	1,510	1,671	1,751
Western Australia	1,171	1,446	2,114
Total	60,653	63,032	66,939

Domestic consumption of black coal in recent years were as follow in thousand tons:

	1972	1973	1974
Iron and steel	8,948	8,981	9,606
Electricity	13,874	14,787	16,253
Railways	33	15	13
Town gas	131	124	124
Cement	899	862	1,031
Metallurgical coke	473	393	478
Other (including bunkers)	2,303	2,521	2,685
Total	26,661	27,683	30,190

Lignite.—Victoria was Australia's only producer of lignite. In 1975 output was 28.2 million tons. Over 95% of the State's production was from the operations of the State Electricity Commission (SEC) at Yallourn and Morwell open pit mines in the Latrobe Valley. Small quantities were produced by Alcoa at Anglesea to supply its own power station, and by Maddingley Brown Coal Co. at Bacchus Marsh. The SEC planned to develop another major mine at Loy Yang in the Latrobe Valley.

Victoria had proven reserves of 66.7 billion tons of lignite, of which 64.9 billion tons were in the Latrobe Valley. In the Latrobe Valley, 30 billion tons had less than 90 meters of overburden. However, a number of factors, including the existing townships, indicate that only about 12.2 billion tons could be developed economically using known mining techniques. At Gelliondale, south of Yallourn, near the coast, International Oils Exploration N.L. held leases on lignite deposits estimated at 1.3 billion tons. One area of the 8-kilometer-long, coal-bearing belt contained 130 million tons, minable by open pit methods, but high-sulfur content makes the coal unsuitable for use as a fuel. The company planned to use a process developed by the Commonwealth Scientific Industrial Research Organization for producing high-grade industrial carbons from the coal.

Petroleum and Natural Gas.—Responding to growing domestic demand, Australian petroleum and natural gas producers set new records in 1975. Crude oil production during the year totaled 150 million barrels (410,628 barrels per day), 6.4% higher than that for 1974. Most of the oil was produced by BHP and Esso Exploration & Production Australia Inc. from the Bass Straight Fields, offshore Victoria, where production totaled 136.4 million barrels, averaging 374,000 barrels per day.

Production from both Moonie, Queensland, and Barrow Island, offshore Western Australia, continued to decrease during the year. Queensland production decreased 23.5% to 460,000 barrels (1,260 barrels per day) while Western Australian production dropped 8.6% to 13,177,400 barrels (36,102 barrels per day). These two States accounted for 0.3% and 8.7%, respectively, of total Australian production. Studies of the Gippsland Basin Field, offshore Victoria, continued throughout the year, and recovable reserves were estimated at 2 billion barrels of liquid hydrocarbons and 7.5 trillion cubic feet of natural gas.

Work was started on development of the Mackerel and Tuna oilfields, offshort Victoria. Production from these fields should begin in 1977 and 1978, respectively. BHP and Esso were granted production licenses for the Snapper and Flounder Fields, also in the Gippsland Basin, during the year. Construction of the No. 2 gasplant at Longford and the third process train of the fractionation plant at Long Island Point was in the final stages. Commissioning of both plants was expected early in 1976. The gasplant, which cost $30 million, doubled gas-processing capacity at Longford and should supply Victoria's requirements until the early 1980's.

There was an overall 15% decrease in exploration drilling activity in 1975, directly attributable to a 30% decline in offshore activity. Total exploration expenditures for oil and gas activities and development drilling during 1975 amounted to $121 million compared with $130 million in 1974. This drilling, including uncompleted holes, totaled 136,815 meters. Onshore development drilling increased slightly with renewal of the development program in the Copper Basin in Queensland.

The Tuna and Mackerel Fields were scheduled for production in 1977 and 1978, respectively. Operations involved the building and installation of a drilling and production platform in each field and the laying of the necessary submarine pipelines to connect the fields to the existing pipeline system. The platforms were being fabricated, and pipelaying operations commenced during the year. Industrial problems, however, caused delays, and it was estimated that work was about 5 months behind schedule at yearend. Crude oil production from the Tuna and Mackerel Fields will help to maintain the Gippsland supply level, as oil production from the Barracuda, Halibut, and Kingfish Fields declines.

Input of crude oil and other feedstock to Australia's 12 refineries totaled 209.2 million barrels. Domestic crude oil supplied 71.2% of this total. The remainder was imported, mainly from Saudi Arabia, Kuwait, and Iraq. Consumption of petroleum products during 1975 totaled 265 million barrels. Motor gasoline (98 million barrels) and fuel oil (48 million barrels) accounted for 55% of total consumption. Refinery product imports for the year total 83.3 million barrels, of which fuel oil, at 13.9 million barrels, was 12.9% lower than in 1974. Exports of refinery products increased 16.9% to 27.1 million barrels. Liquefied petroleum gas, totaling 130 million barrels, was the main export product.

The Mineral Industry of Austria

By William F. Keyes [1]

The Austrian economy suffered its deepest recession since the end of World War II in 1975. The effects, however, were not as severe as in the United States or many other industrialized countries. Real gross national product (GNP) declined about 2%, the first decline in 30 years, and it was forecast that antirecessional government spending and reduced revenues would produce a record government deficit in the following year (1976). Production and value of many of the major minerals were included in the general decline, among them those of aluminum, copper ore, iron ore, iron and steel, and magnesite; production of lead, zinc, and graphite increased slightly.

Austrian output of minerals, metals, and associated products was valued at around \$3 billion [2] in 1975 and accounted for about 8% of the GNP of \$37.57 billion. This figure included the products of the mining, fuels, iron and steel, and other metallurgical industries.

The fundamental mining law of Austria was revised as of October 1, 1975, and was thereafter known as Berggesetz 1975 BGBl. Nr. 259; it replaced Berggesetz 1954 BGBl. Nr. 73, as amended. Minerals were divided under both laws into *bergfrei*, which are open to prospecting and mining with permit; *bundeseigen*, which are the property of the nation; and *grundeigen*, which belong to the owner of the land. Among changes in the 1975 law were the inclusion of uranium and thorium ores specifically in the bundeseigen category; others in this category were hydrocarbons and saline deposits. Chief minerals in the bergfrei category continued to be metallic ores; the grundeigen category included chiefly magnesite and dolomite, as well as clays and nonmetallic minerals. Caverns for storage of hydrocarbons also came under the new law.

PRODUCTION

Austrian minerals production in 1975 was of only domestic significance, except for magnesite, of which it contributed about 13% of world production. Mine production of lead-zinc, copper, iron ore, coal, petroleum, and natural gas, supplemented by imports, supplied much of domestic consumption and permitted the operation of one or more refineries for each mineral. As a percentage of world production none of these minerals reached 1%; production of most was under 0.5% of world production.

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[1] Supervisory physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from the Austrian schilling (AS) to U.S. dollars at the rate of AS17.42=US\$1.00, the floating average for the year.

Table 1.—Austria: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Aluminum:			
Alumina (abrasive grade), gross weight	28,223	NA	NA
Metal:			
Primary	89,131	91,554	88,848
Secondary	26,389	30,592	22,244
Antimony, mine output, metal content	577	540	555
Cadmium metal	29	26	30
Copper:			
Mine output, metal content of ore	2,742	2,687	1,983
Metal:			
Smelter	300	2,600	--
Refined including secondary	22,875	26,713	26,931
Germanium, metal content of concentrate -- kilograms	[1] 5,000	4,300	4,430
Iron and steel:			
Iron ore and concentrate, gross weight thousand tons	4,211	4,245	3,833
Pig iron do	3,006	3,443	3,056
Ferroalloys (electric furnace) do	6	6	e6
Crude steel do	4,328	4,699	4,068
Semimanufactures do	3,198	3,539	3,012
Lead:			
Mine output, metal content of ore	6,139	5,785	6,101
Metal smelter output:			
Primary	9,913	8,804	9,362
Secondary	5,472	6,808	5,779
Manganese, Mn content of domestic iron ore	81,009	80,430	72,768
Silver metal including secondary ---- troy ounces	192,261	--	--
Tungsten, mine output, W content	--	--	362
Zinc:			
Mine output, metal content of ore	22,151	20,977	23,040
Metal, refined	16,999	16,450	16,273
NONMETALS			
Barite	428	361	279
Cement, hydraulic thousand tons	6,260	6,435	5,630
Clays:			
Illite	327,168	387,758	382,599
Kaolin:			
Crude	300,742	312,425	281,200
Marketable	82,923	81,360	e80,000
Other [2]	58,244	78,737	116,815
Diatomite	2,135	1,986	1,570
Feldspar, crude	2,050	--	--
Graphite, crude	17,211	29,550	30,586
Gypsum and anhydrite, crude ------ thousand tons	871	804	715
Lime do	962	1,039	947
Magnesite:			
Crude do	1,419	1,449	1,266
Sintered or dead-burned do	485	547	471
Caustic calcined do	180	157	142
Pigments, mineral, iron mica	9,796	9,546	8,722
Pumice (trass)	24,631	18,207	12,677
Salt:			
Rock thousand tons	1	(3)	1
In brine:			
Evaporated do	292	294	e300
Other do	246	242	258
Total do	539	536	e558
Sand and gravel:			
Quartz sand do	963	911	764
Industrial sand do	246	210	NA
Other sand and gravel do	6,214	9,560	8,015
Stone: [4]			
Dimension stone do	104	124	NA
Quartz and quartzite do	113	100	159
Other quarry stone and broken stone ---- do	1,683	2,217	NA
Sulfur:			
Byproduct do	26	24	26
From gypsum and anhydrite do	16	26	28
Total do	42	50	54
Talc and soapstone	92,205	98,440	86,512
MINERAL FUELS AND RELATED MATERIALS			
Coal, brown coal and lignite thousand tons	3,364	3,629	3,397

See footnotes at end of table.

Table 1.—Austria: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coke:			
Breeze ---- thousand tons	439	1,733	342
Metallurgical ---- do	1,280		1,265
Total ---- do	1,719	1,733	1,607
Gas, manufactured, all types [5] ---- million cubic feet	77,763	77,162	NA
Gas, natural:			
Gross production ---- do	80,163	77,930	83,305
Marketed production ---- do	77,335	71,476	79,869
Natural gas liquids, condensate thousand 42-gallon barrels	214	e 220	222
Oil shale	500	1,470	1,360
Petroleum:			
Crude ---- thousand 42-gallon barrels	17,982	15,609	14,205
Refinery products:			
Gasoline ---- do	13,425	13,368	12,671
Jet fuel ---- do	883	736	620
Kerosine ---- do	77	60	
Distillate fuel oil ---- do	17,642	16,205	15,656
Residual fuel oil ---- do	25,346	24,096	22,309
Lubricants ---- do	1,968	1,782	1,031
Liquefied petroleum gas ---- do	1,185	1,100	1,176
Bitumen ---- do	1,657	2,293	2,293
Other ---- do	3,743	2,926	3,369
Refinery fuel and losses ---- do	1,653	2,496	2,351
Total ---- do	67,579	65,062	61,476

e Estimate. p Preliminary. 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 caloric value of 4,200 calories per cubic meter. (One cubic meter equals 35.3145 cubic feet.)

TRADE

Austria was an exporter of a number of domestically produced minerals, including magnesite, graphite, and antimony; tungsten ore was also soon to be added to the list again. Of these, only magnesite was of importance in terms of world trade.

Net imports included crude minerals for local smelting to supplement the small domestic production. Among them were lead, copper, alumina, iron ore, and coal and coke.

Table 2.—Austria: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Oxide and hydroxide (includes manufactured corundum)	22,136	25,565	Italy 5,121; West Germany 4,224; United Kingdom 2,939; Poland 2,937.
Metal including alloys:			
Scrap	37,018	19,644	Italy 9,368; West Germany 8,432; Czechoslovakia 1,166.
Unwrought	19,509	21,855	West Germany 6,100; Italy 4,688; Turkey 2,812.
Semimanufactures	42,663	44,268	Switzerland 3,250; United Kingdom 2,519; France 2,033.
Antimony ore and concentrate	450	297	NA.
Cadmium metal including alloys, all forms ---- kilograms	6,000	15,200	Belgium-Luxembourg 8,800; Italy 5,000.
Chromium:			
Chromite	30	50	All to Yugoslavia.
Oxide	3,900	7	All to Italy.

See footnotes at end of table.

Table 2.—Austria: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Columbium and tantalum, tantalum metal including alloys, all forms ---- kilograms	9,800	1,200	NA.
Copper:			
Ore and concentrate	5,755	948	West Germany 947.
Copper sulfate	917	230	Italy 220.
Metal including alloys, all forms:			
Scrap	803	500	West Germany 452.
Unwrought	10,009	10,884	West Germany 7,405; Switzerland 3,020.
Semimanufactures	10,443	11,326	United Kingdom 1,445; Sweden 1,321; West Germany 927.
Gold metal, unworked or partly worked ---- troy ounces	15,239	46,522	West Germany 45,622.
Iron and steel:			
Ore and concentrate, except roasted pyrite	950	1,243	Belgium-Luxembourg 800; West Germany 443.
Metal:			
Scrap	7,008	12,865	Italy 5,915; Switzerland 4,755; West Germany 1,984.
Pig iron, ferroalloys, and similar materials ---- thousand tons	27	28	Italy 20.
Steel:			
Primary forms ---- do	286	386	West Germany 252; Hungary 40; Italy 36.
Semimanufactures:			
Bars, rods, angles, shapes, sections ---- do	203	225	Italy 45; Switzerland 25.
Universals, plates, sheets ---- do	597	690	West Germany 205; U.S.S.R. 150; Italy 73; United Kingdom 40.
Hoop and strip ---- do	92	98	Switzerland 24; West Germany 15; Italy 11.
Rails and accessories ---- do	57	70	Switzerland 36; Turkey 8; Romania 6.
Wire ---- do	54	68	Switzerland 18; Italy 11; Hungary 8.
Tubes, pipes, fittings ---- do	149	189	United Kingdom 29; Sweden 29; West Germany 26; Switzerland 23.
Castings and forgings, rough ---- do	7	9	Switzerland 3; West Germany 1.
Lead:			
Oxide	1,587	1,644	Czechoslovakia 810; Yugoslavia 398; Hungary 380.
Metal including alloys, all forms	321	1,514	Yugoslavia 764; West Germany 506.
Magnesium metal including alloys, all forms	780	1,247	West Germany 638; Italy 517.
Manganese:			
Ore and concentrate	5	--	
Oxide	385	381	Brazil 350; West Germany 30.
Mercury ---- 76-pound flasks	339	16	West Germany 11; France 2.
Molybdenum metal including alloys, all forms	591	706	NA.
Nickel metal including alloys, all forms	503	983	West Germany 402; Switzerland 114.
Platinum-group metals and silver metal, including alloys, all forms:			
Platinum group ---- troy ounces	17,651	8,584	West Germany 7,395.
Silver:			
Bullion ---- thousand troy ounces	325	511	West Germany 473.
Other (powder) ---- do	26	10	West Germany 6.
Semimanufactures ---- do	151	167	Yugoslavia 151.
Tin:			
Oxide	6	6	Bulgaria 5.
Metal including alloys, all forms	23	61	West Germany 41; Denmark 6.
Titanium oxide	128	356	West Germany 129; Hungary 72; Romania 60.
Tungsten:			
Ore and concentrate	80	20	NA.
Metal including alloys, all forms	157	177	NA.
Zinc:			
Ore and concentrate	3,170	5,085	Italy 3,965; Yugoslavia 1,120.
Oxide	101	404	Romania 135; Switzerland 120.
Metal including alloys, all forms	1,423	1,028	West Germany 320; Yugoslavia 264; Italy 226.
Other:			
Ore and concentrate	86	260	United Kingdom 198; West Germany 60.
Ash and residue containing nonferrous metals	40,079	45,289	Italy 32,608; West Germany 11,183.

See footnotes at end of table.

Table 2.—Austria: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Other—Continued			
Waste and sweepings of precious metals ---- kilograms --	30,247	14,111	West Germany 14,012.
Oxides, hydroxides and peroxides of metals, n.e.s ----	169	58	West Germany 22; India 21.
Base metals including alloys, all forms, n.e.s ----	1,697	3,490	United States 1,391; United Kingdom 1,150; Italy 810.
NONMETALS			
Abrasives, natural, n.e.s:			
Pumice, emery, natural corundum and other natural abrasives ----	8	2	NA.
Grinding and polishing wheels and stones ----	9,853	11,867	West Germany 1,467; Italy 1,216.
Asbestos ----	54	131	West Germany 121.
Barite and witherite ----	5	--	
Cement ----	223,149	341,525	Poland 144,320; Yugoslavia 81,755; Hungary 78,928.
Chalk ----	2,510	2,386	Hungary 858; Italy 625; Switzerland 408.
Clays and clay products (including all refractory brick):			
Crude clays:			
Kaolin (china clay) ----	17,615	26,648	Italy 16,247; Poland 4,251; Yugoslavia 3,081.
Other ----	667	1,356	West Germany 796.
Products:			
Refractory (including nonclay bricks) ----	247,457	287,368	France 56,824; West Germany 54,972; Sweden 27,703.
Nonrefractory ----	4,834	1,764	West Germany 858; Switzerland 388.
Cryolite and chiolite, natural ----	5	--	
Diamond, industrial ---- value --	--	$27,657	Yugoslavia $23,217.
Diatomite and other infusorial earth ----	455	313	Yugoslavia 228; Romania 53.
Feldspar ----	31	80	All to Czechoslovakia.
Fertilizer materials:			
Crude, unspecified ----	(1)	3	NA.
Manufactured, phosphatic ----	150,260	157,777	Hungary 104,939; Czechoslovakia 29,863; U.S.S.R. 20,436.
Fluorspar ----	212	--	
Graphite, natural ----	15,004	16,914	Poland 7,012; West Germany 5,307; Italy 1,598.
Gypsum and plasters ----	166,734	135,251	West Germany 109,457.
Lime ----	15,815	40,353	Hungary 30,642; Yugoslavia 5,676.
Magnesite ----	158,183	149,019	West Germany 39,553; France 11,981; United States 11,436.
Mica, all forms ----	38	36	Yugoslavia 17; Poland 10.
Pigments, mineral, including processed iron oxides ----	6,573	5,983	United Kingdom 1,526; West Germany 1,480; Netherlands 750.
Precious and semiprecious stones, including diamond:			
Natural ---- kilograms --	867	1,436	NA.
Manufactured ---- do ----	2,229	1,242	NA.
Pyrite ----	100	--	
Salt ----	1	16	Yugoslavia 15.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcerous including marble and limestone ----	80,800	74,835	West Germany 47,197; Switzerland 27,385.
Slate ----	24	11	NA.
Other ----	42,037	50,281	West Germany 47,142.
Worked:			
Paving and flagstone ----	8,174	7,902	Switzerland 5,088; West Germany 2,394.
Slate ----	6	2	NA.
Other ----	1,710	1,963	West Germany 756; United States 243.
Dolomite ----	4,135	5,376	West Germany 1,661; Philippines 1,365; Yugoslavia 506.
Gravel and crushed rock ----	902,767	547,414	Switzerland 372,167; West Germany 144,821.
Limestone ----	2,356	--	
Quartz and quartzite ----	387	327	Czechoslovakia 181; Switzerland 69; Hungary 50.
Sand excluding metal bearing ----	132,373	124,872	Switzerland 63,197; West Germany 49,382.

See footnotes at end of table.

Table 2.—Austria: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Sulfuric acid and oleum	20	555	Yugoslavia 526.
Talc, steatite, soapstone, pyrophyllite	76,083	84,495	West Germany 35,364; Italy 14,349; Switzerland 8,088.
Other nonmetals, n.e.s:			
Crude	6,146	5,137	West Germany 4,132.
Slag, dross and similar waste, not metal bearing	44,407	39,168	West Germany 22,322; Italy 10,134.
Oxides and hydroxides of strontium, barium, magnesium	26	67	Iran 35; Switzerland 18; West Germany 10.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	(1)	2	NA.
Carbon black and gas carbon	10	11	NA.
Coal:			
Anthracite and bituminous, including briquets	43	5	NA.
Lignite and lignite briquets	3,562	8,988	West Germany 8,987.
Coke and semicoke	95,999	27,217	Romania 12,460; West Germany 10,021.
Gas, manufactured ...... thousand tons	26	21	Czechoslovakia 19.
Hydrogen, helium and rare gases thousand cubic feet	8,678	12,908	West Germany 6,124; Hungary 4,732.
Peat including peat briquets and litter	4	74	Yugoslavia 65.
Petroleum refinery products:			
Gasoline, aviation and motor thousand 42-gallon barrels	(1)	62	NA.
Kerosine and jet fuel ...... do	(1)	(1)	NA.
Distillate fuel oil ...... do	10	300	Hungary 298.
Residual fuel oil ...... do	67	74	Czechoslovakia 73.
Lubricants ...... do	916	1,000	Poland 451; Czechoslovakia 330.
Other ...... do	53	62	Yugoslavia 32; Hungary 7.
Total ...... do	1,046	1,498	
Mineral tar and other coal-, petroleum-, or gas-derived chemicals	31,178	16,445	West Germany 7,690; Yugoslavia 4,673.

NA Not available.
[1] Less than ½ unit.

Table 3.—Austria: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite	28,096	32,298	NA.
Oxide and hydroxide	206,314	231,346	West Germany 16,188; Italy 5,121.
Metal including alloys:			
Unwrought including scrap	48,869	35,570	Hungary 6,547; Norway 5,668; West Germany 3,232.
Semimanufactures	21,827	20,620	West Germany 12,324; Switzerland 5,077; Belgium-Luxembourg 2,346.
Antimony:			
Ore and concentrate	138	405	Republic of South Africa 202; Canada 153; Bolivia 45.
Metal including alloys, all forms	139	48	Belgium-Luxembourg 37; Turkey 10.
Arsenic, trioxide, pentoxide, acids	55	47	France 40; West Germany 6.
Cadmium metal including alloys, all forms	6	8	West Germany 6; Netherlands 1.
Chromium:			
Chromite	80,000	114,435	Republic of South Africa 55,241; Turkey 26,484; Iran 12,637.
Oxide and hydroxide	383	474	West Germany 202; People's Republic of China 116; United States 58.
Cobalt oxide and hydroxide kilograms	1,800	3,300	Belgium-Luxembourg 2,500; West Germany 800.
Columbium and tantalum, tantalum metal including alloys, all forms do	12,900	14,000	West Germany 13,500.

See footnotes at end of table.

Table 3.—Austria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Copper:			
Ore and concentrate	8	108	United Kingdom 60; Ireland 40.
Copper sulfate	103	163	West Germany 72; Switzerland 51; Belgium-Luxembourg 40.
Metal including alloys:			
Scrap	11,880	8,937	West Germany 6,308; Switzerland 2,233.
Unwrought	32,356	34,569	West Germany 18,445; Republic of South Africa 5,758.
Semimanufactures	12,739	16,633	West Germany 6,841; United Kingdom 5,499; Sweden 1,880.
Gold metal, unworked and partly worked ... thousand troy ounces	386	2,129	Republic of South Africa 1,197; Switzerland 696.
Iron and steel:			
Ore and concentrate, except roasted pyrite ... thousand tons	1,970	2,800	Brazil 1,529; U.S.S.R. 623; Liberia 310.
Roasted pyrite ... do	141	211	Italy 170.
Metal:			
Scrap ... do	100	88	Poland 60; Czechoslovakia 14; West Germany 12.
Pig iron including cast iron and similar materials [1] ... do	123	87	Hungary 50; West Germany 14.
Ferroalloys:			
Ferromanganese ... do	22	24	Norway 15; West Germany 3.
Other ... do	56	35	Republic of South Africa 7; Norway 5; Italy 4; U.S.S.R. 4.
Steel, primary forms ... do	128	153	Hungary 102; West Germany 27.
Semimanufactures:			
Bars, rods, angles, shapes, sections ... do	119	180	West Germany 91; Switzerland 37; Italy 30.
Universals, plates, sheets ... do	158	126	West Germany 66; France 16; Belgium-Luxembourg 13.
Hoop and strip ... do	27	32	West Germany 23; Sweden 3.
Rails and accessories ... do	3	4	West Germany 3.
Wire ... do	12	15	West Germany 5; Belgium-Luxembourg 3; Sweden 2.
Tubes, pipes, fittings ... do	213	159	West Germany 91; Italy 11.
Castings and forgings, ... do	10	10	West Germany 7; Belgium-Luxembourg 1.
Lead:			
Ore and concentrate	6,391	5,116	Italy 4,903; Yugoslavia 213.
Oxide	148	280	West Germany 78; Switzerland 71; United Kingdom 71.
Metal including alloys:			
Unwrought including scrap	16,115	232	Yugoslavia 10,636; West Germany 2,555.
Semimanufactures	188	189	West Germany 142.
Magnesium metal including alloys, all forms	4,924	1,705	Norway 1,011; Italy 295; West Germany 206.
Manganese:			
Ore and concentrate	742	898	West Germany 386; Morocco 280; Netherlands 180.
Oxide	286	131	Belgium-Luxembourg 60; Japan 30.
Mercury ... 76-pound flasks	525	951	West Germany 252; United States 223; U.S.S.R. 160.
Molybdenum:			
Oxide	675	1,351	NA.
Metal including alloys, all forms	11	21	Netherlands 11.
Nickel:			
Matte. speiss, similar materials	1,603	1,444	Cuba 860; Netherlands 297.
Metal including alloys:			
Unwrought including scrap	2,077	2,751	United Kingdom 747; Netherlands 308; Republic of South Africa 303.
Semimanufactures	1,161	1,445	West Germany 1,072.
Platinum-group metals and silver metal including alloys, all forms:			
Platinum group ... troy ounces	24,852	25,270	West Germany 15,561; United Kingdom 3,697.
Silver:			
Bullion thousand troy ounces	7,170	6,668	United States 2,903; Mexico 1,935; Switzerland 772.
Other (powder) ... do	64	39	All from West Germany.
Semimanufactures ... do	1,048	1,389	West Germany 1,186.

See footnotes at end of table.

Table 3.—Austria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Tin metal including alloys, all forms	669	665	West Germany 153; Malaysia 152; People's Republic of China 99.
Titanium oxide	10,314	9,536	West Germany 4,892; United Kingdom 1,482; Finland 1,243.
Tungsten:			
Ore and concentrate	2,254	1,996	NA.
Oxide and hydroxide	399	430	NA.
Metal including alloys, all forms	41	61	West Germany 40; United States 19.
Zinc:			
Ore and concentrate	330	373	All from Yugoslavia.
Oxide	r 399	884	West Germany 760.
Metal including alloys:			
Scrap and blue powder	1,796	890	Yugoslavia 263; West Germany 183; Hungary 161.
Unwrought	7,275	9,371	Poland 2,320; Bulgaria 1,990; West Germany 1,838; Yugoslavia 1,159.
Semimanufactures	1,297	1,279	West Germany 915.
Other:			
Ore and concentrate	9,985	10,260	United States 4,398; Australia 1,706; Canada 1,457.
Ash and residue containing nonferrous metals	49,726	65,594	U.S.S.R. 30,823; East Germany 13,066.
Waste and sweepings of precious metals ... kilograms	1,010	1,894	Yugoslavia 1,851.
Oxides, hydroxides, peroxides of metals, n.e.s	1,889	1,414	Republic of South Africa 712; United States 307; West Germany 168.
Base metals including alloys, all forms, n.e.s	4,150	4,607	U.S.S.R. 3,576; France 264.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum and other natural abrasives	985	888	West Germany 515; Italy 213; Greece 74.
Dust and powder of precious and semiprecious stones (including diamond) ... kilograms	53	41	United States 26; Switzerland 15.
Grinding and polishing wheels and stones	784	852	West Germany 331; Belgium-Luxembourg 133; United Kingdom 88.
Asbestos	39,592	33,067	Canada 13,041; U.S.S.R. 8,828; Italy 3,663.
Barite and witherite	4,160	3,082	West Germany 2,490; U.S.S.R. 449.
Boron materials:			
Crude natural borates	10,951	12,361	United States 6,432; Turkey 5,732.
Oxide and acid	1,169	1,119	United States 472; Turkey 441; France 127.
Cement	94,187	63,650	West Germany 39,117; Italy 6,074.
Chalk	8,932	9,386	France 8,092; West Germany 820.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	774	792	West Germany 314; United States 269; Italy 128; Yugoslavia 80.
Kaolin	82,516	95,837	U.S.S.R. 29,904; United Kingdom 28,400; West Germany 24,691.
Other	93,657	105,848	West Germany 55,352; U.S.S.R. 34,028.
Products:			
Refractory (including nonclay bricks)	13,208	12,192	West Germany 8,054; Czechoslovakia 1,502; Yugoslavia 1,059.
Nonrefractory	238,790	198,835	Italy 102,583; West Germany 65,273.
Cryolite and chiolite, natural	360	322	Denmark 320.
Diamond industrial ... value	$53,013	$6,580	NA.
Diatomite and other infusorial earth	4,099	6,741	Hungary 3,382; United States 1,223; France 511.
Feldspar	9,506	9,776	Sweden 4,113; Italy 3,359; West Germany 2,087.
Fertilizers:			
Crude:			
Phosphatic	421,227	611,983	U.S.S.R. 186,739; United States 131,383; Israel 118,809; Morocco 104,776.

See footnotes at end of table.

Table 3.—Austria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Fertilizers—Continued			
Crude—Continued			
Potassic	31,010	39,746	East Germany 22,216; West Germany 17,530.
Other	1,820	1,677	West Germany 1,136; Switzerland 450.
Manufactured:			
Nitrogenous	14,647	12,895	Czechoslovakia 6,321; West Germany 3,503; Italy 2,236.
Phosphatic	134,723	217,855	France 109,182; Belgium-Luxembourg 93,174.
Potassic	264,996	356,929	West Germany 16,945.
Other including mixed	8,041	4,775	West Germany 2,946; United States 1,005.
Fluorspar	17,305	14,395	East Germany 6,836; West Germany 4,904; Italy 1,806.
Graphite, natural	274	286	West Germany 236.
Gypsum and plasters	31,439	24,937	Poland 7,153; East Germany 7,068; Switzerland 5,497.
Lime	733	785	West Germany 724.
Magnesite	94,887	98,061	Turkey 59,508; Greece 20,141; Israel 11,728.
Mica:			
Crude, including splittings and waste	444	285	West Germany 148; Norway 94.
Worked, including agglomerate splittings	68	85	Belgium-Luxembourg 41; Switzerland 24.
Pigments, mineral:			
Natural, crude	255	142	France 99; West Germany 15.
Iron oxides, processed	3,051	100	West Germany 2,956.
Precious and semiprecious stones including diamond:			
Natural crude thousand carats	140,445	138,615	Malagasy Republic 40,130; West Germany 32,525; Brazil 31,255.
Manufactured do	87,195	36,945	France 20,030; Switzerland 16,085.
Pyrite (gross weight)	12,470	13,383	U.S.S.R. 7,761; Italy 5,601.
Salt including brine	2,296	8,601	Romania 5,057; Netherlands 962.
Sand and gravel:			
Gravel (including crushed rock)	105,123	158,251	West Germany 141,902; Italy 15,585.
Sand excluding metal bearing	242,975	320,816	West Germany 205,876; U.S.S.R. 75,656.
Stone, n.e.s.:			
Dimension stone:			
Crude and partly worked:			
Calcareous including marble and limestone	11,485	10,199	Italy 6,939; West Germany 1,636.
Slate	2,272	2,051	West Germany 578; Norway 526; France 491.
Other	30,748	31,943	Italy 18,287; Republic of South Africa 6,019.
Worked:			
Paving and flagstone	13,015	11,376	Italy 3,663; Yugoslavia 3,548; West Germany 1,278.
Slate	851	740	France 313; Sweden 201; Italy 148.
Other			
Dolomite, chiefly refractory grade	4,981	5,696	Italy 2,724; Norway 756; France 685.
Limestone, except dimension	4,349	7,605	West Germany 7,274.
Quartz and quartzite	22,971	24,256	West Germany 17,035; Yugoslavia 2,903; Hungary 2,809.
Volcanic material (trass)	1,047	910	West Germany 890.
Sulfur:			
Elemental (all forms)	115,315	154,063	Poland 121,050.
Sulfur dioxide	1,324	2,316	West Germany 2,002; Poland 250.
Sulfuric acid and oleum	65,597	35,331	Poland 27,896; West Germany 3,888; Hungary 3,045.
Talc, steatite, soapstone, pyrophyllite	1,659	2,109	Italy 1,105; Norway 604.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet	30	2	NA.
Other	45,994	50,575	West Germany 27,842; Hungary 13,661.
Slag, dross and similar waste, not metal bearing	29,213	29,511	Italy 13,454; Republic of South Africa 7,801; West Germany 3,160.
Oxides and hydroxides of magnesium, strontium, and barium	948	744	West Germany 609.

See footnotes at end of table.

Table 3.—Austria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,040	850	Trinidad and Tobago 502; West Germany 272.
Carbon black and gas carbon	22,736	23,812	West Germany 15,049; Italy 8,110.
Coal:			
Anthracite and bituminous, including briquets thousand tons	2,878	2,941	Poland 1,123; U.S.S.R. 772; Czechoslovakia 720.
Lignite and lignite briquets do	845	921	Yugoslavia 482; East Germany 218; West Germany 172.
Coke and semicoke do	1,052	1,215	Czechoslovakia 703; West Germany 117.
Gas, natural do	1,211	1,593	U.S.S.R. 1,565.
Hydrogen, helium, rare gases thousand cubic feet	36,346	72,093	West Germany 70,807.
Peat including peat briquets and litter	28,465	35,924	West Germany 14,258; Poland 10,335; U.S.S.R. 7,196.
Petroleum:			
Crude and partly refined oil:			
Crude thousand 42-gallon barrels	44,911	47,389	Iraq 27,707; Libya 7,326; U.S.S.R. 6,179; Iran 4,297.
Partly refined do	1,842	291	Romania 133; East Germany 104.
Refinery products:			
Gasoline, aviation and motor do	8,919	5,414	Italy 1,987; West Germany 1,884; Czechoslovakia 904.
Kerosine do	2	8	West Germany 6.
Distillate fuel oil do	500	826	West Germany 316; Italy 291; Switzerland 89.
Residual fuel oil do	12,421	8,507	West Germany 3,212; Poland 1,237; Switzerland 809.
Lubricants do	837	857	Hungary 289; West Germany 161; Netherlands 113.
Mineral jelly and wax do	109	107	West Germany 55; Hungary 20; East Germany 14.
Other do	2,299	2,096	West Germany 1,046; Italy 894.
Total do	25,087	17,815	
Mineral tar and other coal–, petroleum–, or gas-derived crude chemicals	10,392	9,215	Netherlands 2,630; West Germany 2,555; U.S.S.R. 2,333; Czechoslovakia 1,113.

r Revised. NA Not available.
[1] Includes spiegeleisen, shot, powder, and sponge.

COMMODITY REVIEW

METALS

Aluminum.—Two producers of aluminum from imported alumina comprised the Austrian industry in 1975, as follows:

Company	Location	Ownership	Capacity (tons per year)
Salzburger Aluminium GmbH (SAG).	Lend, Salzburg Province.	Swiss Aluminium, Ltd., (Alusuisse), 100%	12
Vereinigte Metallwerke Ranshofen-Berndorf AG (VMRB).	Ranshofen, Braunau-am-Inn.	Austrian Government, 100%	80

VMRB's plans to increase annual capacity from 80,000 to 130,000 tons were indefinitely postponed. Instead the company acquired one-third participation in Aluminiumhütte Hamburg, in West Germany, and was to receive 30,000 tons of aluminum per year from this source to supply its fabricating plants. VMRB obtained its alumina largely from the plants of Gebrüder Giulini GmbH at Ludwigshafen and Vereinigte Aluminium Werke AG at Stade, both in West Germany.

SAG cancelled plans to expand capacity from 12,000 to 28,000 tons per year by 1976, because of high electricity costs. The firm obtained alumina during the year from plants partly owned or operated by Alusuisse in Guinea, Australia, Italy, and West Germany.

Antimony.—The small production of antimony (stibnite) continued at the mine at Schlaining, near Oberwart, Bürgenland Province, owned and operated by Bleiberger Bergwerks–Union AG. Concentrates were exported for smelting and refining.

Copper.—Austria's only producer of copper ore in 1975 was the mine at Mühlbach am Hochkönig, Salzburg Province, operated by Kupferbergbau Mitterberg GmbH, a corporation owned by the Austrian Government. Concentrates from the mine were treated at the smelter and electrolytic refinery of Montanwerke Brixlegg GmbH, at Brixlegg, Tirol Province, which was a division of the Austrian Government-owned aluminum producer, VMRB. Most of the feed to Brixlegg was, however, provided by scrap and imported blister.

Work continued in 1975 on expansion of the Mühlbach mine from a capacity of 250,000 tons of ore per year to 330,000 tons (of about 1.5% copper content). Expansion at Brixlegg was also slated to raise smelter capacity to 18,000 tons per year and refinery capacity to 30,000 tons per year.

Iron and Steel.—Domestic iron ore production declined at three mines owned by the nationalized steel company, VÖEST-Alpine Montan AG (VAM). The largest of these, the Erzberg mine, located 20 kilometers northwest of Leoben, Steiermark (Styria) Province, produced around nine-tenths of the total of about 3.8 million tons of ore, containing about 31% iron. The nearby Radmer mine and the Huttenberg mine, further south in Kärnten (Carinthia) Province, each contributed half the remainder.

Imports, largely from Brazil and the U.S.S.R., were added to domestic ore and smelted at the two major pig iron-ingot steel plants at Linz, in Upper Austria on the Danube, and at Donawitz in Styria, near Leoben. Steel production also declined about 15% to around 4 million tons as a result of low demand.

In the 5-year period from 1975 to 1979 the iron and steel industry planned to spend a total of about $1 billion for capital improvements. New facilities to be installed at Linz were a sixth blast furnace of 5,500-ton-per-day capacity, a rolling mill, a continuous casting plant for the production of billets, a wire mill, and a seamless pipe mill. The trend towards replacing open-hearth capacity with basic oxygen furnaces was to continue.

In mid-1975, retroactive to January 1, 1975, the merger of three individual nationally owned specialty steel producers took place. Boehler Brothers, Schoeller-Bleckmann, and Steirische Gusstahlwerke were renamed "Vereinigte Edelstahlwerke AG" (VEW), which like its predecessors was a subsidiary of VAM.

Lead and Zinc.—All domestic mine production of lead and zinc was from the operations of the Bleiberger-Bergwerks-Union AG (BBU), an Austrian Government corporation operating at Bleiberg-Kreuth, Kärnten (Carinthia) Province, near the Italian border; the mine provided most of the domestic zinc consumption but only a quarter of lead requirements. Concentrates from the mine were treated at the nearby lead smelter and zinc refinery at Gailitz-Arnoldstein. The smelter processed lead concentrates from Italy on toll to supplement the Austrian concentrate.

Exploration continued at an intensive pace at Bleiberg-Kreuth, although no major additions to the ore body were announced. At Arnoldstein the electrolytic zinc plant, established in 1955 with a capacity of 10,000 tons per year, was to be expanded from 17,000 to 22,000 tons capacity by 1977.

Tungsten.—Mining and concentrating of tungsten ore were resumed in 1975; previously tungsten ore had been produced in Austria from 1957 to 1971 at Hinter Tux, Tirol Province, southeast of Innsbruck. Scheelite occurrences are frequent in the Austrian Alps.

The new mine and mill, located at Mittersill, Salzburg Province, were operated by Wolfram GmbH, owned by the Austrian steel combine VAM (47.5%), Metallgesellschaft AG of West Germany (47.5%), and a U.S. firm, Teledyne, Inc., of Los Angeles (5%). Total investment was estimated at $30 million.

Production at the Mittersill mine was due to reach 1,000 to 1,200 tons per year of WO_3 in scheelite concentrate from ore containing about 0.6% to 0.7% WO_3. For the first 5 years of operation the ore will be produced by open pit mining; in subsequent years underground mining will be employed. Reserves are reported to be about 2.5 million tons of ore, sufficient for about 15 years of operation at the planned rate.

The scheelite concentrates were to be converted to tungsten powder and carbide in a plant situated in Poelfing-Bergla, Steiermark (Styria) Province, south of Graz, on the site of an abandoned coal mine. This plant was due to start operations late in 1976.

Uranium.—Under the new mining law that took effect on October 1, 1975, uranium and thorium ores became property of the Federal Government.

There was no production of uranium in Austria, but exploration for uranium ore was underway in two areas. At Forstau, near Schladming, Salzburg Province, Bergbau und Mineral Gesellschaft Pryssok & Co. KG had proven reserves of about 1,600 tons of U_3O_8, and estimated reserves were set at several thousand tons. At Mitterberg, Kupferbergbau Mitterberg located uranium ore bodies in its copper mine and conducted experiments in leaching the ore.

Although average uranium content of Austrian ores was low (500 to 800 grams per ton), the Government expected that mining them would become economic in time. It was planned to establish a uranium mining company, to be controlled by Österreichische Industrieverwaltungs AG (ÖIAG), which is the Government's industrial development agency, by other Government agencies, and by Pryssok.

NONMETALS

Graphite.—Three localities yielded graphite. Two of these sites, both owned by Graphitbergbau Kaiserberg Franz Mayr-Melnhof und Co., were in the Styrian Alps, west of Leoben—the Kaiserberg mine, the largest, at St. Stefan ob Leoben, near St. Michael, and the Trieben mine at Hohentauern. In Mühldorf, Lower Austria, near Spitz, west of Vienna, graphite was recovered from old tailings.

Magnesite.—Six magnesite mines continued to operate during the year, but production fell off because of lower demand for refractories from the European steel industry.

Of the two large producers, the larger was the Österreichisch-Amerikanische Magnesit-Aktiengesellschaft (ÖMAG), controlled by General Refractories Co. of the United States. ÖMAG had three mines: Radenthein, in Carinthia, where the main plant was located; Hochfilzen, the largest mine, in the Tirol; and the Tux mine, at Mayrhofen, also in the Tirol. The other large producer, Veitscher Magnesitwerke AG, controlled by Magnesia AG of Switzerland, operated three mines in Styria: Hohentauern near Trieben, Breitenau near Mixnitz, and Oberdorf near St. Katharein a.d. Laming, which was operated by a subsidiary, the Steirische Magnesit-Industrie AG.

MINERAL FUELS

Energy.—Austria produced over one-third of its energy from domestic sources in 1974. Domestic production of petroleum, natural gas, and hydroelectric power contributed about equally to the supply, and the country was a net exporter of electrical energy. Consumption of about 31 million tons of standard coal equivalent corresponded to about 4 tons per capita, compared with about 12 tons per capita in the United States. One-half of imported energy consisted of petroleum, mainly crude, from the Middle East and eastern Europe; the remainder was in the form of coal and coke from eastern Europe and natural gas from the U.S.S.R. An energy balance for 1973 and 1974 is presented in table 4.

Coal and Coke.—Production of coal in Austria declined to 3.4 million tons in 1975, compared with 3.6 million in 1974 and a peak of 7 million in 1957. About one-sixth was classified as Glanzkohle, and the rest as Braunkohle, all being commonly referred to as brown coal or lignite.

The largest producer, with over 70% of the output, was the Graz-Köflacher Eisenbahn und Bergbaugesellschaft, which operated seven mines in Styria, in the area between Leoben and the Italian border. Other producers in Oberösterreich (Upper Austria), with five mines between them, were Wolfsegg-Traunthaler Kohlenwerks AG and Salzach-Kohlenbergbau GmbH. All were nationalized concerns.

Overall, in addition to its domestic lignite production, Austria imported lignite, coal including coking coal, and coke. The national steel company, VAM, was considering in 1975 the possible advantage of acquiring an interest in a U.S. mining operation to assure a long-term supply of coking coal and to diversify sources of supply. Present import contracts were to run until about 1984, so that time remained for careful consideration of future supply sources.

Petroleum and Natural Gas.—Austria had a modest production of crude petroleum and natural gas in 1975, both of which, however, supplied a significant part of its energy requirements. The major producer was the Österreichische Mineralölverwaltung AG (ÖMV), a government corporation, operating largely in the Matzen-Auersthal and other fields in the Vienna basin northeast of Vienna. Smaller producers were Rohoel-Aufsuchungs GmbH (RAG) and Tiefbohrunternehmen Richard K. van Sickle. ÖMV and RAG also operated in Oberösterreich (Upper Austria) Province.

The only petroleum refinery in Austria was operated by ÖMV at Schwechat, in the southeast suburbs of Vienna. Capacity of this plant reached 280,000 barrels per calendar day in 1975.

Reserves of petroleum were reported[3] to be 167 million barrels at yearend 1975. Reserves of nonassociated gas were estimated at 14,200 million cubic meters at the beginning of the year.

A third Austria-Soviet Union natural gas contract was signed in August, providing for total Soviet gas deliveries of at least 2,500 cubic meters annually until the year 2000. Soviet authorities also indicated willingness to supply 250 million to 500 million cubic meters of gas annually to help bridge possible gaps between 1975 and 1978 when deliveries under the second and third contracts begin. Austria will in turn supply the Soviet Union with at least 1 million tons of steel pipe.

[3] U.S. Bureau of Mines. International Petroleum Annual, 1974. March 1976, p. 28.

Table 4.—Austria: Supply and apparent consumption of chief energy-producing materials for 1973 and 1974

(Million tons of standard coal equivalent)[1]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Fuel-wood	Hydro-electric power
1973:						
Production	11.9	1.8	3.8	3.0	0.9	2.4
Imports	20.9	4.3	13.8	2.4	(2)	.4
Exports	.8	.1	.1	--	--	.6
Apparent consumption	[3] 32.0	6.0	17.5	5.4	.9	2.2
1974:						
Production	11.7	1.8	3.3	2.9	.9	2.8
Imports	20.6	4.5	12.5	3.1	.1	.4
Exports	.9	(2)	.1	--	--	.8
Apparent consumption	[3] 31.4	6.3	15.7	6.0	1.0	2.4

[1] 1 ton standard coal equivalent (SCE)=7,000,000 kilocalories.
[2] Less than one-half unit.
[3] Includes refinery and other losses.

Source: Adapted from World Energy Supplies, 1950–1974, United Nations Statistical Paper, ser. J, No. 19.

The Mineral Industry of Belgium and Luxembourg

William F. Keyes [1]

Belgium in 1975 suffered the worst recession in over 20 years. Real gross national product (GNP) shrank 1.4% to $60.57 billion;[2] industrial production, including minerals, dropped almost 10%; and exports, which account for about half of Belgian GNP, were down 4% in current terms. The 12-month average unemployment rate rose from 4.4% in 1974 to 6.8% in 1975, and reached 8.7% by yearend. Inflation proceeded at an annual rate of 11%, higher than that of Belgium's chief European neighbors; oil, grain, and other commodity price increases over the preceding 2 years had led immediately to wage increases, which in Belgium were tied (indexed) to the cost of living.

During the year expansion continued at a copper smelter, expansion of one oil refinery was completed, additional coal mine closings were reported, and two direct reduction steel plants were proposed.

BELGIUM

PRODUCTION

The index of production in the extractive industries declined to just under 70 (1970=100) compared with 75 in 1974. A continuing decline in coal production accounted for most of the change; other mineral production, chiefly quarry products such as quartzite, marble, and sand, also was at a rate below the previous year. Production rates in the major sectors of the minerals economy, namely iron and steel, copper smelting, and zinc smelting, all participated in the general decline.

[1] Supervisory physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from Belgian francs (BF) to U.S. dollars at the rate of BF36.78=US1.00, the approximate floating average during the year.

Table 1.—Belgium: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 p
METALS			
Aluminum metal, secondary only	r 7,100	5,900	e 4,300
Cadmium	r 1,128	1,044	966
Copper:			
Blister e	16,000	16,000	15,000
Refined including alloys	r 378,000	388,308	357,021
Iron and steel:			
Iron ore and concentrate ---- thousand tons	115	123	93
Pig iron ---- do	r 12,655	13,021	9,084
Ferroalloys ---- do	111	131	98
Steel:			
Crude ---- do	15,522	16,224	11,585
Semimanufactures ---- do	r 12,656	13,245	7,910
Lead metal:			
Primary	103,000	99,600	103,000
Secondary	r 10,688	10,008	11,949
Total	r 113,688	109,608	114,949

See footnotes at end of table.

Table 1.—Belgium: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity[1]	1973	1974	1975[p]
METALS—Continued			
Tin metal:			
Primary	3,669	3,418	4,562
Secondary	1,731	818	954
Total	5,400	4,236	5,516
Zinc metal:			
Primary	[r] 276,688	288,868	218,200
Secondary (remelted zinc)	[r] 4,400	4,700	6,763
Total	[r] 281,088	293,568	224,963
Other nonferrous metals:			
Precious metals worked, not further specified[2] thousand troy ounces	[r] 25,803	36,332	30,046
Unspecified base metals[3]	[r] 4,660	5,236	[e] 3,900
NONMETALS			
Cement, hydraulic thousand tons	[r] 7,043	7,467	6,884
Clays, n.e.s do	408	240	116
Fertilizer materials, manufactured:			
Phosphatic, gross weight:	361	430	[e] 390
Nitrogenous, nitrogen content do			
Thomas slag do	[r] 1,359	1,350	[e] 1,000
Superphosphatic, ordinary do	218	253	[e] 100
Other do	517	551	[e] 470
Gypsum and anhydrite, calcined	[r] 114,036	102,204	221,267
Lime and dead-burned dolomite:			
Quicklime thousand tons	[r] 3,096	3,228	2,520
Dead-burned dolomite do	322	330	[e] 250
Sodium and sodium compounds, n.e.s., sodium carbonate	398,700	359,100	[e] 355,000
Stone, sand and gravel:			
Calcareous:			
Dolomite thousand tons	2,191	2,588	2,497
Limestone do	[r] 23,940	23,784	23,227
Marble:			
In blocks cubic meters	3,431	2,652	2,333
Crushed and other	10,655	9,876	2,840
Petit granite (Belgium bluestone):			
Quarried cubic meters	[r] 297,708	361,476	407,560
Sawed do	[r] 68,016	70,860	67,826
Worked do	[r] 9,228	11,796	10,465
Crushed and other do	231,855	346,968	537,611
Porphyry, all types thousand tons	[r] 6,925	5,486	5,436
Quartzite	433,992	440,295	372,294
Sand and gravel:			
Construction sand thousand tons	9,586	11,484	10,246
Foundry sand do	1,358	1,416	1,028
Dredged sand do	701	941	[e] 790
Glass sand do	[r] 1,764	1,920	1,611
Other sand do	[r] 2,472	2,892	2,536
Gravel (dredged)	6,214	6,336	[e] 5,700
Sandstone:			
Rough stone, including crushed do	2,142	2,300	2,104
Paving and mosaic stone	758	552	407
Other	[r] 45,288	48,660	44,076
Slate, roofing and other	[r] 2,210	1,982	[e] 1,100
Sulfur, byproduct:			
Elemental thousand tons	30	26	24
Other forms do	205	197	172
Total do	235	223	196
MINERAL FUELS AND RELATED MATERIALS			
Carbon black[e]	2,000	2,000	2,000
Coal:			
Anthracite thousand tons	2,503	2,038	1,507
Bituminous do	[r] 6,340	6,073	5,972
Total do	[r] 8,843	8,111	7,479
Coke, all types do	7,801	8,052	5,728
Fuel briquets, all kinds do	456	420	269
Gas:			
Manufactured million cubic feet	35,194	35,404	[e] 25,600
Natural do	3,860	4,299	[e] 4,290

See footnotes at end of table.

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

Commodity [1]	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum, refinery products:			
Gasoline thousand 42-gallon barrels	40,429	36,278	39,122
Jet fuel do	9,614	6,840	3,235
Kerosine do	1,131	318	NA
Distillate fuel oil do	89,936	73,347	68,490
Residual fuel oil do	83,442	71,429	65,743
Lubricants do	294	707	NA
Other do	33,858	23,400	26,939
Refinery fuel and losses do	10,597	8,703	3,873
Total do	269,301	221,022	207,402

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.

TRADE

Belgium's balance of payments position, consolidated with that of Luxembourg, was satisfactory during the year with a surplus of $640 billion; this marked a positive balance for the sixth year in a row. However, a deficit of $1.81 billion was registered in the balance of trade to which Belgium's sizable imports of raw materials contributed.

Belgium's trading partners continued to be largely the other members of the European Economic Community (EEC). Some 71% of Belgian exports, including large amounts of refined and fabricated mineral products, went to other members of the Common Market. Of Belgian imports, 67%, including significant amounts of iron ore, coal, aluminum, clays, and fertilizers, came from Common Market members. Ores and concentrates for the important Belgian nonferrous smelting industry came largely from Africa and the Americas. There was a moderate minerals trade between the United States and Belgium in which the largest item was coal shipments to the Belgian steel industry.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite and concentrate	247	175	United Kingdom 59; Republic of South Africa 50; Spain 28.
Oxide and hydroxide	92	306	West Germany 193; Netherlands 27.
Ash and residue containing aluminum	2,083	2,524	West Germany 1,473; France 1,026.
Metal including alloys:			
Scrap	20,171	20,177	France 9,316; West Germany 7,593; Netherlands 1,414.
Unwrought	20,220	20,297	Netherlands 7,882; West Germany 3,747; France 3,649; Italy 2,075.
Semimanufactures	182,045	195,971	West Germany 38,249; France 34,727; Netherlands 28,730.
Antimony:			
Ore and concentrate	--	188	Netherlands 81; United Kingdom 56; France 50.
Metal including alloys, all forms	73	160	Bulgaria 100; France 59.
Arsenic, natural sulfides	23	95	NA.
Beryllium metal including alloys, all forms kilograms	--	600	NA.
Bismuth metal including alloys, all forms	721	832	France 585; Netherlands 83.
Cadmium metal including alloys, all forms	1,033	871	France 319; West Germany 234; United States 209.

See footnote at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Chromium:			
Chromite	--	475	NA.
Oxide, hydroxide, trioxide	119	70	Greece 35.
Metal including alloys, all forms	48	123	West Germany 71; France 35; Japan 16.
Copper:			
Ore and concentrate	42	1,004	Finland 942.
Matte	2,141	5,886	West Germany 5,668.
Copper sulfate	7,777	9,348	Netherlands 2,206; West Germany 1,588; Denmark 1,173; Brazil 1,085.
Ash and residue containing copper	4,590	6,384	West Germany 2,752; United Kingdom 2,495.
Metal including alloys:			
Scrap	18,741	16,116	West Germany 5,115; France 4,671; Italy 1,997.
Unwrought	326,235	295,344	France 113,210; West Germany 64,639; United Kingdom 26,519.
Semimanufactures	158,076	151,260	West Germany 40,428; France 36,491; Netherlands 24,942.
Germanium metal including alloys, all forms	8	26	France 20, Italy 3.
Gold:			
Waste and sweepings value, thousands	$141	$75	Netherlands $26.
Metal, unworked or partly worked thousand troy ounces	455	757	West Germany 246; Switzerland 169; United Kingdom 98.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	77	69	France 57; Netherlands 8.
Roasted pyrite do	169	174	West Germany 162.
Metal:			
Scrap do	559	727	West Germany 342; France 175.
Pig iron, including cast iron do	17	11	France 7; West Germany 3; Netherlands 1.
Sponge iron, powder, shot do	752	3,401	Netherlands 1,481; France 1,183; West Germany 537.
Spiegeleisen	1,388	514	West Germany 262; France 210.
Ferromanganese thousand tons	59	58	West Germany 19; France 19; Italy 5.
Other do	29	18	West Germany 6; France 8; Sweden 2; United States 1.
Steel, primary forms do	2,422	2,543	France 1,159; West Germany 426; Netherlands 411.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	6,466	6,053	West Germany 1,290; France 1,031; United States 779; U.S.S.R. 522.
Universals, plates, sheets do	5,335	5,660	France 1,531; West Germany 1,149; Netherlands 768.
Hoop and strip do	922	849	France 37; West Germany 21.
Rails and accessories do	102	115	Italy 21; France 16; Turkey 13; Portugal 12.
Wire do	450	350	West Germany 82; United States 76; France 64; Netherlands 60.
Tubes, pipes, fittings do	327	338	West Germany 88; Netherlands 68; France 66; U.S.S.R. 26.
Castings and forgings, rough do	39	42	West Germany 10; Netherlands 6; France 5.
Lead:			
Ore and concentrate	526	4,866	France 4,820.
Oxides	5,856	6,605	West Germany 2,592; Netherlands 2,483.
Ash and residue containing lead	2,745	8,537	West Germany 1,527.

See footnote at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Lead—Continued			
Metal including alloys:			
Scrap	10,262	11,253	France 6,886; West Germany 2,401; Netherlands 1,483.
Unwrought	68,016	52,869	Netherlands 17,196; France 15,136; West Germany 6,862.
Semimanufactures	4,915	4,407	Netherlands 1,985.
Magnesium metal including alloys:			
Scrap	397	542	United Kingdom 164; United States 161; Netherlands 74; Italy 73.
Unwrought and semimanufactures	194	307	West Germany 36; France 33.
Manganese:			
Ore and concentrate	2,846	6,797	Netherlands 3,153; France 1,476.
Metal	113	169	West Germany 104; Netherlands 33; Australia 20.
Mercury ---- 76-pound flasks	1,459	5,338	Netherlands 3,742; West Germany 1,450.
Molybdenum:			
Ore and concentrate	2,376	3,317	West Germany 1,174; Italy 604; Sweden 464; Spain 350.
Metal including alloys, all forms	84	35	France 12; Netherlands 4.
Nickel:			
Matte, speiss, and similar materials	25	45	West Germany 3.
Metal including alloys:			
Scrap	1,970	2,002	West Germany 912; United Kingdom 464; France 231.
Unwrought	213	315	Netherlands 65; United States 54; West Germany 44.
Semimanufactures	764	2,672	Netherlands 27; France 13.
Platinum-group metals, including alloys, all forms ---- thousand troy ounces	76	82	West Germany 47; France 13.
Selenium, elemental ---- kilograms	49,100	75,000	Netherlands 38,800; West Germany 12,100.
Silver metal including alloys thousand troy ounces	22,560	28,390	United Kingdom 11,199; West Germany 5,738; France 2,676.
Tin:			
Ore and concentrate	225	749	Spain 742.
Oxides	138	180	France 117; Netherlands 28.
Metal including alloys:			
Scrap	138	227	Netherlands 144; France 36; West Germany 18.
Unwrought	1,941	1,799	West Germany 557; France 454; Turkey 218; Italy 170.
Semimanufactures	377	512	West Germany 108; France 17; Switzerland 10; Netherlands 9.
Titanium:			
Ore and concentrate	82	48	NA.
Oxides	28,942	30,632	West Germany 10,484; Italy 1,846; Poland 1,375; United States 1,374.
Metal including alloys, all forms	17	86	West Germany 76.
Tungsten:			
Ore and concentrate	88	160	France 75; United Kingdom 49; West Germany 27.
Metal including alloys, all forms	59	136	Netherlands 91.
Uranium and thorium ore and concentrate	[1] 339	54	France 47.
Vanadium oxides ---- kilograms	18,200	10,300	NA.
Zinc:			
Ore and concentrate	50,579	68,950	France 42,353; West Germany 21,849.
Oxides	7,201	40,853	Netherlands 28,040; West Germany 6,205; France 5,788.
Ash and residue containing zinc	52,932	6,338	Netherlands 1,918; West Germany 1,457; United States 847.
Metal including alloys:			
Scrap	9,045	8,972	France 7,658.
Blue powder (dust)	28,420	31,506	West Germany 12,665; Netherlands 8,190; France 4,552.
Unwrought	221,678	193,632	West Germany 55,575; France 29,887; United States 23,277; Netherlands 19,395.
Semimanufactures	8,703	7,879	West Germany 3,177; Netherlands 1,892; Switzerland 623.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Other:			
Ore and concentrate:			
Of columbium, tantalum, vanadium and zirconium	132	216	France 122; West Germany 91.
Of precious metals	--	1	NA.
Of base metals, n.e.s	73	627	France 331.
Ash and residue containing nonferrous metals, n.e.s	29,396	26,876	West Germany 4,985.
Waste and sweepings of precious metals ...... value, thousands	$1,406	$2,366	West Germany $811; United Kingdom $767, Italy $394.
Oxides, hydroxides, pentoxides of metals, n.e.s	5,636	5,973	West Germany 1,695; Netherlands 858; United States 839; France 704.
Metals including alloys, all forms:			
Metalloids:			
Tellurium and arsenic	30	33	West Germany 5; Italy 3.
Other	142	163	France 44; West Germany 34; Netherlands 26.
Alkali, alkaline earth, rare-earth metals	69	56	NA.
Pyrophoric alloys .. kilograms	100	26	NA.
Base metals including alloys, all forms, n.e.s	17,261	15,997	NA.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	2,952	6,553	NA.
Dust and powder of precious and semiprecious stones, natural and manufactured ...... kilograms	710	621	United States 126; Israel 107; West Germany 93.
Grinding and polishing wheels and stones	2,781	3,922	France 1,590; West Germany 402.
Asbestos	433	645	France 329; Netherlands 293.
Barite and witherite	6,887	416	NA.
Boron materials:			
Crude natural borates	4,097	9,634	Netherlands 7,394; France 983.
Oxide and acid	1,305	306	West Germany 153; Romania 45.
Bromine ...... kilograms	300	460	NA.
Cement ...... thousand tons	1,652	1,593	Netherlands 938; West Germany 136.
Chalk	82,353	67,250	Netherlands 2,619; Saudi Arabia 1,116.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	97	929	NA.
Kaolin	15,175	8,778	Netherlands 5,002; France 1,186; West Germany 981.
Other	6,456	3,689	France 1,329; United Kingdom 685; West Germany 488; Switzerland 125.
Products:			
Refractory (including nonclay brick)	102,130	48,379	France 22,419; Italy 6,509; Mexico 4,680.
Nonrefractory ...... value, thousands	$22,087	$22,960	Netherlands $7,278; West Germany $5,872; France $5,169.
Cryolite and chiolite	1,140	164	NA.
Diamond:			
Gem:			
Unworked .. thousand carats	5,733	5,479	India 1,766; United Kingdom 1,705; Israel 907.
Worked ...... do	2,503	2,777	United States 772; Switzerland 240.
Industrial:			
Unworked ...... do	8,865	9,104	Ireland 2,345; United States 1,857; United Kingdom 1,773.
Worked ...... do	90	27	United Kingdom 9; West Germany 7; Switzerland 4; France 3.
Diatomite and other infusorial earth	900	5,491	Netherlands 5,154.
Feldspar, leucite, nepheline, nepheline syenite	6,849	11,902	Netherlands 10,382.

See footnote at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Fertilizer materials:			
Crude:			
Nitrogenous	957	1,323	France 599; Lebanon 500; West Germany 178.
Phosphatic	34,114	39,805	France 21,523; West Germany 6,800; United Kingdom 3,259.
Potassic K_2O content	126	207	Netherlands 189.
Manufactured:			
Nitrogenous, N_2 content thousand tons	369	389	France 95; West Germany 69.
Phosphatic P_2O content do	335	359	France 136; West Germany 106.
Potassic, K_2O content do	253	287	France 58; Norway 48.
Other including mixed do	1,385	15	France 8.
Ammonia do	170	160	France 140.
Fluorspar	557	1,321	France 7.
Graphite, natural	148	7	France 4; West Germany 1.
Gypsum and plasters	31,635	35,141	West Germany 22,354; Netherlands 9,682.
Lime thousand tons	729	709	Netherlands 590.
Magnesite	1,669	2,034	France 323; Netherlands 330.
Mica:			
Crude including splittings and waste	132	70	NA.
Worked including agglomerated splittings	1,170	1,360	United States 356; United Kingdom 321.
Pigments, mineral including processed iron oxides	4,165	4,369	France 1,615; Italy 1,474.
Precious and semiprecious stones:			
Natural (except diamond):			
Unworked kilograms	11,308	6,026	France 2,040; Switzerland 805; Italy 596.
Worked:			
Gem do	186	1,754	West Germany 173.
Industrial do	10	(2)	Mainly to Israel.
Manufactured[3] do	169	155	West Germany 100; United Kingdom 12.
Pyrite (gross weight)	1,235	548	NA.
Salt and brine	150,199	123,690	France 116,504.
Sodium and potassium compounds thousand tons	415	447	Netherlands 90; West Germany 66; France 50; United States 49.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous do	1,028	1,059	Netherlands 1,000.
Slate do	3	3	Netherlands 1; West Germany 1.
Other do	64	59	NA.
Worked:			
Slate do	1	1	Mainly to West Germany.
Paving and flagstone do	8	9	Netherlands 7; West Germany 1; France 1.
Other do	12	11	West Germany 4; France 3; Netherlands 2.
Dolomite, chiefly refractory grade do	1,545	1,835	France 170.
Gravel and crushed rock do	8,598	8,988	Netherlands 4,439; France 3,911.
Limestone (except dimension) do	532	600	Netherlands 430; France 169.
Quartz and quartzite do	10	15	West Germany 12; Mexico 1; Netherlands 1.
Sand, excluding metal bearing do	3,229	3,989	Netherlands 1,116; France 958; Italy 589; West Germany 391.
Sulfur:			
Elemental, all forms do	21,391	18,759	Morocco 5,358; France 3,631; Netherlands 2,381; Brazil 1,690.
Sulfur dioxide	46	203	NA.
Sulfuric acid	201,190	286,903	France 135,843; West Germany 85,300.
Talc, steatite, soapstone, pyrophyllite	17,538	21,813	West Germany 6,140; United Kingdom 3,230; Sweden 2,918; France 2,714.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet	598	231	NA.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Other nonmetals, n.e.s.—Continued			
Crude—Continued			
Lithium minerals	7,992	6,263	Netherlands 6,015.
Vermiculite, perlite, chlorite	139	233	NA.
Other thousand tons	1,521	761	Netherlands 744.
Slag, dross and similar waste, not metal bearing do	2,903	2,847	Netherlands 944; France 898.
Oxides and hydroxides of magnesium, strontium, and barium	744	666	Colombia 400.
Halogens	20	19	Brazil 9.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	19,339	9,204	Netherlands 9,073.
Carbon black and gas carbon:			
Carbon black	22,828	20,165	West Germany 19,092.
Gas carbon	58	150	NA.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	591	527	West Germany 313; France 106.
Briquets of anthracite and bituminous coal do	55	61	France 32; West Germany 23.
Lignite and lignite briquets	36	32	NA.
Coke and semicoke thousand tons	456	409	France 185; Netherlands 59; Sweden 58; West Germany 56.
Gas natural million cubic feet	4	26,177	West Germany 26,135.
Hydrogen, argon, and other rare gases	13,799	15,550	France 7,342; Netherlands 2,247; West Germany 1,722; United Kingdom 1,641.
Peat including peat briquets and litter	902	4,883	Sweden 2,853; France 1,059.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	2,216	411	Sweden 225; West Germany 185.
Refinery products:			
Gasoline do	27,254	5,324	Netherlands 1,144; West Germany 769.
Kerosine do	4,783	2,213	Sweden 446; Denmark 318; United Kingdom 266.
Distillate fuel oil do	30,581	21,348	Sweden 7,310; West Germany 6,090; Netherlands 3,680.
Residual fuel oil do	39,966	31,961	Sweden 6,568; West Germany 3,494; Netherlands 2,827.
Lubricants do	2,281	2,633	Netherlands 778; West Germany 220.
Other:			
Liquefied petroleum gas do	1,550	1,653	United States 627; Netherlands 277; West Germany 247.
White spirits do	949	1,371	West Germany 578; Netherlands 241; Norway 138.
Mineral jelly and wax do	14	20	Netherlands 5.
Nonlubricating oils, n.e.s. do	25	32	Netherlands 9; Saudi Arabia 8; Lebanon 4.
Bitumen and other residues do	3,261	2,894	Netherlands 1,081; United Kingdom 712; West Germany 401.
Bituminous mixtures, n.e.s. do	68	66	Netherlands 24; West Germany 18; France 13.
Pitch, pitch coke, petroleum coke do	192	283	France 194; Netherlands 69.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons	224	230	Netherlands 73; West Germany 65; France 45; United States 26.

NA Not available.
[1] Figure does not contain thorium in 1973.
[2] Less than ½ unit.
[3] May include diamond.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	14,961	23,814	Guyana 9,593; West Germany 9,120.
Oxide and hydroxide	16,256	17,442	West Germany 15,251.
Ash and residue containing aluminum	3,090	1,219	West Germany 522; Italy 333; France 292.
Metal including alloys:			
Scrap	18,810	18,138	Netherlands 10,582; France 4,057; West Germany 954.
Unwrought	234,740	253,205	Netherlands 104,400; France 35,902; Norway 21,731.
Semimanufactures	60,939	70,110	West Germany 31,771; Netherlands 19,243; France 8,306.
Antimony:			
Ore and concentrate	12,024	9,221	Bolivia 4,896; Canada 1,546.
Metal including alloys, all forms	352	72	West Germany 63.
Arsenic:			
Natural sulfides	24	24	NA.
Trioxide, pentoxide, acids	252	311	France 289.
Beryllium metal including alloys, all forms ---- kilograms	800	200	NA.
Bismuth metal including alloys, all forms	485	717	Bolivia 505; Peru 90.
Cadmium metal including alloys, all forms	1,259	1,477	Japan 615; U.S.S.R. 356.
Chromium:			
Chromite	3,170	4,051	Republic of South Africa 1,034; Mozambique 730; West Germany 507; Netherlands 459.
Oxide and hydroxide	778	693	West Germany 558; France 85.
Metal including alloys, all forms	118	200	West Germany 86; France 38.
Cobalt oxides and hydroxides ---- kilograms	10,500	11,900	NA.
Copper:			
Ore and concentrate	30,990	32,406	Zaire 5,406; Australia 3,928; Morocco 3,441.
Matte	223,682	201,189	Zaire 140,728.
Copper sulfate	783	652	France 434; Netherlands 106.
Ash and residue containing copper	28,224	54,878	France 21,281; Japan 10,118; United States 8,905; Chile 5,796.
Metal including alloys:			
Unwrought	308,865	292,323	Zaire 119,612; France 29,289; West Germany 25,571.
Semimanufactures	22,913	25,466	West Germany 14,557; France 3,452.
Germanium metal including alloys, all forms	16	17	Italy 15; West Germany 2.
Gold:			
Waste and sweepings ---- value, thousands	$1,207	$1,446	United States $1,343.
Metal, unworked and partly worked ---- thousand troy ounces	956	3,499	Switzerland 843.
Iron and steel:			
Ore and concentrate, except roasted pyrite ---- thousand tons	32,417	33,430	France 13,534; Sweden 8,875.
Roasted pyrite ---- do	568	497	France 305; West Germany 136.
Metal:			
Scrap ---- do	698	870	France 456; Netherlands 182; West Germany 106.
Pig iron including cast iron ---- do	234	233	West Germany 120; France 91.
Sponge iron, powder, shot ---- do	7	9	France 2; West Germany 2; Sweden 2.
Spiegeleisen ---- do	(1)	(1)	Mainly from West Germany.
Ferroalloys ---- do	202	215	France 76; Norway 75; West Germany 42.
Steel, primary forms ---- do	1,225	970	West Germany 265; Netherlands 233; France 163.
Semimanufactures:			
Bars, rods, angles, shapes, sections ---- do	764	724	France 401; West Germany 139; Netherlands 111.
Universals, plates, sheets ---- do	669	654	West Germany 222; Netherlands 149; France 102; Japan 86.
Hoop and strip ---- do	127	116	France 65; West Germany 24.
Rails and accessories ---- do	7	33	France 6; West Germany 3.
Wire ---- do	45	60	West Germany 30; France 14.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Semimanufactures—Continued			
Tubes, pipes, fittings thousand tons	166	182	West Germany 73; France 46; Netherlands 30.
Castings and forgings, rough do	15	16	France 4; West Germany 4.
Lead:			
Ore and concentrate	105,161	88,030	Peru 16 641; Morocco 14,521; Greece 11,934; Ireland 11,785.
Ash and residue containing lead	57,478	45,663	United States 11,426; France 9,525; United Kingdom 7,174.
Oxides	3,752	2,246	West Germany 1,330; France 386; Mexico 290.
Metal including alloys:			
Scrap	12,445	11,497	West Germany 5,455; Netherlands 2,957; United Kingdom 1,124.
Unwrought	13,614	24,786	United States 7,979; Netherlands 4,622; France 3,705; West Germany 3,025.
Semimanufactures	1,631	2,943	West Germany 1,915.
Magnesium metal including alloys:			
Scrap	111	270	Netherlands 254.
Unwrought	1,319	1,465	Norway 470; Italy 323; Netherlands 223; France 148.
Semimanufactures	95	150	West Germany 72; United States 26; Italy 25.
Manganese:			
Ore and concentrate	423,991	400,426	Republic of South Africa 210,159; Zaire 59,143; Angola 53,983.
Oxides	1,646	2,220	Japan 1,751; West Germany 276.
Metal	884	1,226	Netherlands 535; Japan 312.
Mercury 76-pound flasks	2,300	5,773	West Germany 5,454.
Molybdenum:			
Ore and concentrate	10,987	12,545	Canada 6,158; United States 3,439.
Metal including alloys, all forms	231	70	United States 17; Netherlands 17; Germany 12.
Nickel:			
Matte, speiss, similar materials	73	271	Netherlands 232.
Metal including alloys:			
Scrap	1,611	1,423	France 404; West Germany 260; United States 243.
Unwrought	2,797	3,988	United Kingdom 907; Cuba 592; U.S.S.R. 467; Canada 404.
Semimanufactures	1,850	3,427	West Germany 2,034; France 366.
Platinum-group metals including alloys, all forms troy ounces	108,695	108,881	France 39,731; United Kingdom 35,456; Brazil 9,902.
Selenium, elemental kilograms	19,600	19,100	Netherlands 8,300; West Germany 4,200; United States 3,300.
Silver metal including alloys thousand troy ounces	11,105	23,517	Netherlands 7,640; United States 7,450.
Thorium ore and concentrate kilograms	94,000	--	
Tin:			
Ore and concentrate	5,688	5,281	Zaire 2,906; Rwanda 1,934.
Oxides	49	30	West Germany 16; Netherlands 13.
Metal including alloys:			
Scrap	75	83	West Germany 58.
Unwrought	1,568	2,914	Malaysia 1,583; Zaire 450.
Semimanufactures	280	256	Netherlands 98; West Germany 83; France 26.
Titanium:			
Ore and concentrate	70,936	120,527	Canada 100,217.
Oxides	13,082	11,618	West Germany 5,413; Netherlands 4,509.
Metal including alloys, all forms	967	1,739	United States 1,376.
Tungsten:			
Ore and concentrate	418	458	People's Republic of China 311; Zaire 68.
Metal including alloys, all forms	246	266	West Germany 42; Netherlands 36.
Uranium:			
Ore and concentrate	101	52	NA.
Metal including alloys, all forms	6	6	France 6.
Zinc:			
Ore and concentrate	636,923	644,850	Canada 318,110; Netherlands 96,967; Sweden 71,399.

See footnote at end of table.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Zinc—Continued			
Oxide and peroxide	10,455	9,273	France 4,168; Netherlands 1,675; United Kingdom 1,131.
Ash and residue containing zinc	52,812	90,404	West Germany 55,198.
Metals including alloys:			
Scrap	4,293	12,066	United States 6,222; Netherlands 2,270; West Germany 1,842.
Blue powder	1,321	1,681	West Germany 1,284.
Unwrought	67,021	69,592	Zaire 12,642; United States 10,392; Netherlands 9,734.
Semimanufactures	10,355	10,903	France 8,006; West Germany 2,143.
Other:			
Ore and concentrate:			
Of columbium, tantalum, vanadium, zirconium	3,940	2,282	Netherlands 556; Australia 510; West Germany 438; United States 268.
Of precious metals	351	252	Colombia 251.
Of base metals, not elsewhere specified	3,453	8,075	Sudan 6,196.
Ash and residue containing nonferrous metals, n.e.s	74,838	45,059	U.S.S.R. 1,062; United States 1,036.
Waste and sweepings of precious metals ...... value, thousands	$8,871	$41,859	Netherlands $30,226; United States $8,712.
Oxides, hydroxides, peroxides of metals, n.e.s	3,474	3,247	West Germany 1,238.
Metals including alloys, all forms:			
Metalloids:			
Tellurium and arsenic	73	66	Sweden 51.
Other	798	851	West Germany 257; Norway 256; France 204.
Alkali, alkaline earth, rare-earth metals	145	112	West Germany 56; France 46.
Pyrophoric alloys	48	6	United Kingdom 3; Austria 2; France 1.
Base metals, including alloys, all forms, n.e.s	20,045	18,245	NA.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	126,956	144,841	West Germany 110,257; France 19,576.
Dust and powder of precious and semiprecious stones, natural and manufactured, including diamond ...... kilograms	1,710	27,246	United States 821.
Grinding and polishing wheels and stones	2,760	2,874	West Germany 874; France 590; Austria 468.
Asbestos	85,615	82,662	Canada 38,623; U.S.S.R. 17,890.
Barite and witherite	14,546	7,210	France 5,200.
Boron materials:			
Crude natural borates	58,555	71,557	Netherlands 48,458; Turkey 21,695.
Oxide and acid	4,076	2,241	France 1,369.
Bromine ...... kilograms	21,100	79,100	NA.
Cement	78,499	150,318	Netherlands 73,320; France 43,976.
Chalk	114,125	114,577	France 82,765.
Clays and clay products:			
Crude clay, n.e.s.:			
Bentonite	11,315	17,296	West Germany 9,555; Greece 2,123.
Kaolin	277,598	301,766	United Kingdom 108,906; West Germany 104,961; Netherlands 95,232.
Other	259,858	273,867	West Germany 156,022; France 46,957; Netherlands 32,234.
Products:			
Refractory (including nonclay brick)	155,762	169,604	West Germany 98,386; Austria 20,881.
Nonrefractory ...... value, thousands	$48,198	$80,326	Italy $24,031; West Germany $21,302; Netherlands $11,986.
Cryolite and chiolite	147	339	Denmark 271.
Diamond (except powder):			
Gem:			
Unworked ...... thousand carats	13,863	10,425	Mainly from United Kingdom.

See footnote at end of table.

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Diamond (except powder)—Continued			
Gem—Continued			
Worked ---- thousand carats --	1,139	1,276	India 203; Israel 156; U.S S.R. 154; Republic of South Africa 138.
Industrial:			
Unworked ---- do ----	6,654	8,545	United States 2,489; United Kingdom 1,973; Ireland 1,704.
Worked ---- do ----	6	28	Ireland 8; United Kingdom 4.
Diatomite and other infusorial earth ---	6,599	8,402	France 3,549; Denmark 2,082; United States 1,282.
Feldspar, leucite, nepheline, nepheline syenite ----	72,562	78,559	Norway 47,805; France 17,532.
Fertilizer materials:			
Crude:			
Nitrogenous ----	18,366	19,199	Chile 18,937.
Phosphatic --- thousand tons --	2,287	2,407	Morocco 1,478.
Potassic ----	(2)	(2)	
Manufactured:			
Nitrogenous, N_2 content ----	107,216	72,490	West Germany 23,047; Netherlands 22,096; France 20,942.
Phosphatic, P_2O_5 content ----	8,867	16,534	Netherlands 6,427; Tunisia 6,164; United Kingdom 1,929.
Potassic ----	(2)	(2)	
Other including mixed ----	128,053	163,954	France 99,787; West Germany 19,387; Netherlands 18,972.
Ammonia ----	2,667	2,244	Netherlands 1,099; West Germany 963.
Fluorspar ----	12,779	15,433	France 8,473; West Germany 5,042.
Graphite, natural ----	5,518	1,454	France 534; West Germany 331; Malagasy Republic 247; Austria 208.
Gypsum and plasters ----	476,052	537,189	France 493,016.
Lime ----	187,536	210,102	France 163,868.
Magnesite ----	22,723	29,716	Greece 15,138; Brazil 3,068.
Mica:			
Crude including splittings and waste	3,397	3,171	India 1,645; Malagasy Republic 588.
Worked including agglomerated splittings ----	60	94	West Germany 31; United Kingdom 25; Switzerland 17.
Pigments, mineral, including processed iron oxides ----	8,375	11,237	West Germany 8,207.
Precious and semiprecious stones, except diamond:			
Natural:			
Unworked ---- kilograms --	10,923	5,550	West Germany 2,395; Switzerland 1,349.
Worked:			
Gem ---- do ----	1,838	3,262	West Germany 1,503.
Industrial ---- do ----	218	256	United States 186.
Manufactured ---- do ----	4,763	25,794	United States 6,905.
Pyrite (gross weight) ----	247,829	257,916	Spain 160,138.
Salt and brine ---- thousand tons --	866	1,144	Netherlands 602; West Germany 508.
Sodium and potassium, n.e.s ----	29,008	40,244	Netherlands 30,839.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked ----	191,784	143,128	France 90,133; Portugal 23,299; Italy 16,882.
Worked ----	45,441	59,257	Italy 22,235; France 13,130.
Dolomite, chiefly refractory grade --	50,052	68,724	France 39,381; West Germany 12,968.
Gravel and crushed rock thousand tons --	5,313	5,936	Netherlands 3,675; West Germany 591.
Limestone (except dimension) ----	18,928	208,571	United Kingdom 163,545.
Quartz and quartzite ----	108,555	112,231	France 72,434; Norway 12,041.
Sand, excluding metal bearing thousand tons --	8,577	8,544	Netherlands 7,656.
Sulfur:			
Elemental, all forms ----	673,779	938,533	United States 479,863; Netherlands 252,928.
Sulfur dioxide ----	3,855	4,246	West Germany 3,153.
Sulfuric acid ----	151,047	238,079	West Germany 144,816; Poland 34,146.
Talc, steatite, soapstone, pyrophyllite ---	58,491	39,958	United States 17,748; Netherlands 6,772; France 4,745.

See footnote at end of table.

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Other nonmetals, n.e.s.:			
Crude:			
Lithium minerals	7,419	7,525	Mozambique 7,231.
Vermiculite, perlite, chlorite	29,527	26,841	U.S.S.R. 16,156; Greece 5,610.
Other	132,429	125,933	Netherlands 51,087; Spain 33,548; West Germany 24,314.
Slag, dross, and similar waste, not metal bearing	222,133	346,880	France 239,605; West Germany 36,470.
Oxides and hydroxides of magnesium, strontium, and barium	2,142	2,068	West Germany 591; France 380; United Kingdom 310.
Halogens (other than chlorine and bromine)	135	207	Chile 186.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	8,004	40,602	France 34,047; Netherlands 5,825.
Carbon black and gas carbon:			
Carbon black	31,295	32,920	West Germany 11,891; Netherlands 9,870.
Gas carbon	1,654	2,711	West Germany 2,367; France 299.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	7,488	9,977	West Germany 4,823; Poland 1,731; United States 1,448.
Briquets of anthracite and bituminous coal do	147	89	West Germany 73; Netherlands 16.
Lignite and lignite briquets do	74	85	West Germany 84.
Coke and semicoke do	4,253	4,545	West Germany 3,510.
Gas, natural million cubic feet	342,711	1,023,186	Netherlands 402,662.
Hydrogen, argon, rare gases	8,112	7,635	Netherlands 4,483; West Germany 2,749.
Peat including peat briquets and litter	88,716	101,292	Netherlands 51,638; West Germany 48,961.
Petroleum:			
Crude and partly refined:			
Crude thousand 42-gallon barrels	264,519	205,113	Saudi Arabia 114,163; Iran 33,304; Kuwait 22,076.
Partly refined do	4,466	7,274	U.S.S.R. 1,095; Italy 1,080.
Refinery products:			
Gasoline do	7,296	25,536	West Germany 24,651.
Kerosine do	931	55	All from Netherlands.
Distillate fuel oil do	16,059	18,148	Netherlands 10,525; U.S.S.R. 2,785; Italy 1,847.
Residual fuel oil do	24,647	31,297	Kuwait 6,644; Saudi Arabia 3,618.
Lubricating oils and grease do	3,597	3,623	Netherlands 999; United Kingdom 655; France 491; West Germany 465.
Other:			
Liquefied petroleum gas do	3,782	4,446	Netherlands 3,535; West Germany 620.
White spirits do	394	3,419	Netherlands 3,380.
Mineral jelly and wax do	132	157	West Germany 63; France 27; Netherlands 27.
Nonlubricating oils, n.e.s do	21	64	Netherlands 58.
Bitumen and other residues do	420	526	France 299; Netherlands 203.
Bituminous mixtures, n.e.s. do	296	418	Netherlands 267; France 60.
Pitch, pitch coke, petroleum coke do	2,591	2,811	United States 2,021.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	81,540	120,820	Netherlands 58,352; West Germany 33,592; France 15,281.

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 1973 was: 606,016 tons K_2O equivalent. Principal sources in 1973 were: West Germany 270,585; France 136,748; U.S.S.R. 104,737. Total for 1974 was 654,076 tons. Principal sources in 1974 were: West Germany 260,364; France 184,679; U.S.S.R. 137,624.

COMMODITY REVIEW

Metals.—*Aluminum.*—Belgium does not produce bauxite, alumina, or primary aluminum. The small aluminum metal production, which in recent years has been under 10,000 tons, was a product of a number of scrap melting operations. There was, however, an important production and trade in semimanufactures based on imported ingots.

Copper.—Belgium was in 1975 the second largest producer of refined copper in Europe, after West Germany. Copper was obtained principally as matte and ingots; Zaire was the main source, with smaller quantities from other African countries. Belgium also participated in a strong inter-European trade in smelted metal and semimanufactures. Belgium was an important supplier of the German and France manufacturing industries. By far the largest producer of refined copper was Métallurgie Hoboken-Overpelt S.A., with a smelter at Hoboken and refinery at Olen, both near Antwerp; the company also was a major producer of numerous other nonferrous metals.

In 1975, Metallo-Chimique, S.A., a smaller copper refiner, continued construction to expand the capacity of its smelter-refinery at Beerse by 50,000 tons per year. The expansion is due to be completed by 1977.

Iron and Steel.—Belgium was heavily dependent on its steel industry; production per capita was almost three times that of the United States. The industry itself was dependent on imported ore; in 1975 only one small mine near the French border was in operation.

The largest producer of crude steel was S.A. Cockerill-Ougrée-Providence et Espérance-Longdoz (Cockerill), with major plants near Liège, which accounted for about half of the Belgian production. Other important producers were Ste. Métallurgique Hainaut-Sambre S.A. (HS), at Couillet, near Charleroi; Forges de Thy-Marcinelle et Monceau S.A. (TMM) at Marcinelle, near Charleroi; S.A. Forges de Clabecq, at Clabecq, south of Brussels; Usines Gustave Boël (UGB), at La Louvière, west of Charleroi; and Maritieme Staalnijverheid N.V., also called Sidérurgie Maritime S.A. (SIDMAR), at Zelzate, north of Ghent.

The Belgian steel industry was dependent on selling its products abroad, and in 1975 suffered severely from the worldwide decline in business activity, as the index of steel production fell from 127 (that is, percent of 1970) to 87. In an effort to increase competitiveness, the industry initiated several moves that would eventually decrease costs.

A 400,000-ton-per-year direct reduction plant was proposed by TMM and HS, both of which belong to the group headed by Albert Frère, to be erected at Tertre, west of Mons. A second plant, of the same size, was under study by the same group for a site at Zeebrugge on the Belgian coast. Both plants are novel to the extent that they plan to use coke oven gas, which no direct reduction plants have so far utilized.

A project for a ministeelworks at Monceau, of a type being installed in neighboring countries, was also advanced by the Frère group, but no concrete project had been announced.

It was reported that the percentage of steel produced in open hearth and electric furnaces in Belgium remained constant at about 5% from 1970 to 1974; that produced by the basic Bessemer process declined from 42% to 14%; and that produced by basic oxygen furnaces increased from 52% to 80% during the same period. Total steel production increased from 12.6 million to 16 million tons in the same period. Employment in the Belgian steel industry remained fairly steady in the 1964–74 decade at 63,000, with a small decline in the middle of the period.

Lead and Zinc.—The production index for these two commodities fell from 127 in 1974 to 87 in 1975, reflecting the low level of economic activity in Belgium and worldwide.

Belgium was a major producer of primary zinc and a large producer of primary lead in 1975, both from imported ores and concentrates; some secondary metal was also recovered. Most of the metal produced was exported to other European countries. The two major zinc producers in 1975 were Société des Mines et Founderies de Zinc de la Vieille-Montagne, S.A., with its main office at Angleur near Liege, smelter at Flone, southwest of Liege, and electrolytic zinc plant at Balen, east of Antwerp, and Hoboken-Overpelt, at its new electrolytic zinc refinery at Overpelt, in the northeast. Vieille Montagne also produced lead at Balen, but Hoboken's smelter (at Hoboken) was a larger producer of this commodity.

Energy and Fuels.—Belgium was a large net importer of energy in 1975, largely in the form of coal from West Germany, natural gas from the Netherlands, and petroleum from the Middle East. The approximate energy balance given in table 4 for 1973 and 1974, the latest years available, shows a heavy but decreasing reliance on imported petroleum.

Coal.—Total Belgian coal production has declined severely in the post-World War II period and in 1975 reached a new low of 7.5 million tons; maximum production reached was 30.3 million tons in 1952. Imports continued high, and underground and surface employment, which was over 100,000 some 20 years ago, was down to 26,700 at the end of 1975. About three-quarters of Belgian coal production in 1975 came from the Kempen (Campine) Field, in the province of Limburg, northeast Belgium. The largest mines operated there, by the Naamloze Vennootschap Kempense Steenkolenmijnen, were at Zolder, with a current production of about 2.2 million tons per year; Waterschei, with about 1 million; and Winterslag, Eisden, and Beringen, each producing somewhat less than a million tons per year.

Table 4.—Belgium-Luxembourg: Supply and apparent consumption of chief energy-producing materials for 1973 and 1974

(Million tons of standard coal equivalent) [1]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Hydro-electric and nuclear power
1973:					
Production	9.1	8.9	--	0.1	0.1
Imports	86.7	8.7	64.9	12.9	.2
Exports	26.2	.8	[2]24.8	.3	.3
Apparent consumption	[3]69.6	16.8	[3]40.1	12.7	([4])
1974:					
Production	8.4	8.1	--	.2	.1
Imports	81.3	10.8	54.8	15.4	.3
Exports	18.9	.9	[2]16.9	.8	.3
Apparent consumption	[3]70.8	18.0	[3]37.9	14.8	.1

[1] 1 ton standard coal equivalent=7,000,000 kilocalories.
[2] Includes bunkers.
[3] Includes refinery and other losses.
[4] Less than ½ unit.

Source: Adapted from World Energy Supplies, 1950–1974, United Nations Statistical Paper, Ser. J., No. 19.

Petroleum.—Expansion of the Feluy oil refinery, between Brussels and Charleroi, was completed by Chevron Oil Belgium, at a total cost of $22 million. Expansion of facilities in the Antwerp port area, which are connected with Feluy by pipeline, was included. Capacity of the plant has thus been raised from 5 million to 7 million tons per year (140,000 barrels per day) of crude.

Eight refineries, with a total refinery capacity of 946,300 barrels per calendar day of crude, operated during the year. Largest was the refinery of Société Industrielle Belge des Petroles S.A. at Antwerp, with a capacity of 340,000 barrels per day of crude; other large refineries were those of Texaco at Ghent (180,000 barrels), Albatros (120,000 barrels), and Belgisch Petroleum Raffinderij N.V. (100,000 barrels), both at Antwerp. An extension of the Esso refinery at Antwerp was under construction to raise its capacity from 75,000 to 245,000 barrels per day by 1976.

LUXEMBOURG

Almost half of Luxembourg's industrial production and 20% of the GNP is accounted for by the steel sector. With nearly all steel production destined for foreign markets, both national income and balance of trade were heavily influenced by activity in world steel markets in 1975. After many years of continuing growth at an average rate of 3.5% and of increasing prosperity culminating in the boom year of 1974, 1975 came as a rude shock to the Luxembourg economy, which registered a 7.7% drop in the GNP. Luxembourg steel production fell 28.3%, and steel exports 16.9% in 1975, and the negative effect was aggravated by a fall in steel prices of between 20% and 40%.

Two companies comprised the Luxembourg steel industry. Aciériés Réunies de Burbach-Eich-Dudelange S.A. (ARBED) was by far the largest. A minor producer was Métallurgique et Minière de Rodange-Athus (MMRA). ARBED owned iron mines, steel mills, and steel fabricating plants in Luxembourg; steel mills in the Saar and Cologne area in West Germany; iron ore mines in France (the chief source of ore) and Brazil; coal mines in Germany; and a controlling interest in SIDMAR, the Belgian steel producer.

In 1975, ARBED acquired the Red Ash coal mine in West Virginia, as part of its overall strategy to remain competitive. It was also considering an ore pipeline from the coast, as well as further integration of its Luxembourg activities with its foreign interests.

Table 5.—Luxembourg: Production of mineral commodities
(Thousand metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Iron ore and concentrate	3,782	2,686	2,315
Pig iron (including blast furnace ferroalloys)	5,089	5,468	3,889
Steel:			
Crude	5,924	6,448	4,624
Semimanufactures	4,706	4,986	4,546
NONMETALS			
Cement, hydraulic	357	391	343
Fertilizers, manufactured, phosphatic, Thomas slag, gross weight	859	1,036	971
Gypsum and anhydrite, crude ... metric tons	[e] 4,200	3,570	4,819
Quartz, quartzite, glass sand ... do	23,928	31,920	29,560
Stone, sand and gravel, n.e.s.:			
Sand:			
Molding	25	4	3
Other, industrial	860	866	1,208
Stone:			
Building stone:			
Rough cut ... thousand cubic meters	6	11	27
Facing ... thousand square meters	NA	1	1
Cut stone, crude ... cubic meters	314	35	212
Crushed stone	265	475	NA
Dolomite, n.e.s	454	494	475
Paving blocks ... thousand pieces	18	13	13
Slate slabs ... thousand square meters	12	10	5
MINERAL FUELS AND RELATED MATERIALS			
Manufactured gas ... million cubic feet	[r] 94,890	78,860	[e] 60,000

[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 of Bolivia contributed about 11% to the gross domestic product (GDP) in 1975. Petroleum and natural gas accounted for 7.2% of the GDP in 1975 compared with 10.6% in 1974. The mineral industry provided 59% and petroleum and natural gas provided 29% of the total value of Bolivia's exports.

Corporación Minera de Bolivia (COMIBOL), after taxes and other allowances, had a loss of $10.7 million[2] compared with a profit of $5.1 million in 1974. Although costs of labor, materials, and equipment continued to rise, the loss was more related to a 9% decline in sales.

The Medium Miners Association increased from about 28 companies in 1974 to about 34 in 1975. Production of tin by the Medium Miners increased 8% over that of 1974. Production of copper, lead, bismuth, and sulfur was less than that in 1974; exports of antimony, tungsten, and zinc increased slightly.

The third largest group within the mining sector of Bolivia and part of the private sector is the Small Miners Association, which during 1975 accounted for 6% of the total export value of the mining sector. Tin and antimony are the two major commodities exploited by the Small Miners and in 1975 both suffered price drops that affected mineral output. Of the about 2,000 Small Miners operating in 1974 out of the 5,000 in the Inventory of Small Mines, only one-half were operating during 1975. All of the low grade tin producers closed down operations due to high costs and low prices. Royalties paid by the Small Miners to the Government were reduced to almost nothing.

Because of falling market prices, tin export quotas were imposed by the International Tin Council for three quarters of the year. Tin exports were down more than production which led to some stockpiling and some tin being exported for refining under toll contracts. Other mineral exports also suffered because of lower prices, and the total c.i.f. value of mineral exports decreased 21% from that of 1974. The United States purchased 40% of Bolivia's mineral exports in 1975. During 1975 Bolivia took some important steps toward revitalizing the minerals sector. Harvard University completed a study of Bolivia's mining taxation system that had been commissioned by the Ministry of Mines. The mining sector bears a large percentage share of Bolivia's fiscal burden, mainly in the form of export taxes. The Ministry is reportedly moving toward a mixed system of taxes on profits and export taxes recommended by the Harvard study. Further measures to stimulate the mining industry included a planned new mining development law to come out in 1976 that will open presently closed mining areas and offer incentives to foreign and domestic capital to work these areas under mining operation contracts, and a planned revolving minerals exploration fund.

COMIBOL took a number of technical measures in 1975 as part of its triennial plan to increase efficiency in some of its mines.

The Ministry of Mines presented projects for the 5-year development plan 1976–80. Compared with past investment plans, gross investment in the mining sector will decrease as its percentage declines from 14%

[1] Physical scientist, Division of Nonferrous Metals.

[2] Where necessary, values have been converted from pesos Bolivian ($b) to U.S. dollars at the rate of 20$b=US$1.00.

to 8%. This change of emphasis implies a greater diversification of the future Bolivian economy. An important objective is the smelting and refining of a greater percentage of Bolivia's mine output. Empresa Nacional de Fundiciones (ENAF) plans to refine about three-fourths of the country's mineral production by 1980.

The Italian firm AGIP, S.p.A. completed preliminary exploration for uranium in its four areas and will go ahead with a drilling program around Corocora.

PRODUCTION

Of the 13 metals mined in Bolivia in 1975, only gold, iron, and silver showed increases. Mine output of tin at 28,720 tons, was down slightly from that of 1974. Of the nonmetals, production of cement increased 12% but elemental sulfur production fell 48%. Natural gas production fell 5%, while crude oil production fell 11%.

Table 1.—Bolivia: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS [2]			
Antimony:			
Mine output, metal content	14,933	13,060	11,796
Metal [3]	21	--	131
Arsenic, mine output, white arsenic equivalent [3]	--	11	10
Bismuth:			
Mine output, metal content	588	613	611
Metal [3]	500	575	584
Cadmium, mine output, metal content [4]	169	135	138
Copper, mine output, metal content	8,555	8,130	6,391
Gold, mine output, metal content [5] troy ounces	36,349	43,272	53,218
Iron ore:			
Gross weight	[6] 16,582	--	[3] 31,584
Metal content	[6] 10,364	--	[3] 19,740
Lead:			
Mine output, metal content	20,995	17,449	15,216
Metal including alloys [3]	50	21	--
Manganese ore:			
Gross weight	643	513	1,236
Metal content	193	154	371
Silver, mine output, metal content thousand troy ounces	5,803	5,385	5,470
Tin:			
Mine output, metal content [7]	30,318	29,498	28,720
Metal including alloys	6,865	7,049	7,533
Tungsten, mine output, metal content	2,184	2,821	2,036
Zinc, mine output, metal content	51,744	48,221	47,114
NONMETALS			
Barite [3]	--	3,851	1,805
Cement, hydraulic [8]	165,638	202,298	226,251
Feldspar-related minerals, sodalite [3]	--	--	--
Gypsum, crude [9]	1,400	3,251	570
Lime, hydrated [9]	--	--	85
Magnesite [3]	--	--	60
Stone: Calcite [3]	105	83	85
Sodium sulfate [3]	--	--	70
Sulfur, elemental [3]	56,393	41,769	21,921
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural:			
Gross production million cubic feet	151,199	144,128	137,297
Marketable production do	57,857	60,539	60,092
Natural gas liquids:			
Natural gasoline thousand 42-gallon barrels	76	78	86
Liquefied petroleum gas do	48	65	144
Petroleum:			
Crude do	17,266	16,603	14,732
Refinery products:			
Gasoline do	2,272	2,332	3,215
Jet fuel do	148	227	330
Kerosine do	990	919	1,111

See footnotes at end of table.

Table 1.—Bolivia: Production of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Distillate fuel oil ____thousand 42-gallon barrels__	849	919	1,144
Residual fuel oil ____do____	1,041	1,124	1,263
Lubricants ____do____	58	68	74
Other:			
Liquefied petroleum gas ____do____	94	125	198
Unspecified ____do____	1	2	4
Refinery fuel and losses ____do____	80	216	26
Total ____do____	5,533	5,932	7,365

[p] Preliminary.

[1] In addition to the commodities listed, salt and a variety of construction materials such as clays, stone (crushed, broken and dimension), sand, and gravel are produced but information is inadequate to permit formulation of reliable estimates of output levels.

[2] Unless otherwise specified, data represent the sum of production by COMIBOL and exports by medium and small mines.

[3] Total national exports; tantamount to total production.

[4] Contained in zinc concentrates produced by COMIBOL; not recovered in elemental form in Bolivia.

[5] COMIBOL output plus sales by placer mines (medium and small mines cannot legally export gold).

[6] National exports excluding some part of approximately 50,000 metric tons (gross weight) containing about 32,000 metric tons of iron that was exported from the Mutun 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 the ENAF smelter and exports of medium and small mines.

[8] Sales by cement plants.

[9] Total national exports; total output is believed to considerably exceed this figure but no basis is available for formulation of reliable estimates of output levels.

TRADE

Preliminary figures indicated an export value of $217 million f.o.b. for minerals and $154 million for petroleum and natural gas in 1975. These are decreases from 1974 figures of $49 million for minerals and $34 million for petroleum and natural gas.

In 1975 the private mining sector exported minerals valued c.i.f. at approximately $142 million, down $48 million from that of 1974. COMIBOL's exports (c.i.f.) amounted to $172 million, down $24 million from that of 1974.

The value of exported silver, zinc, cadmium, iron, manganese, gypsum, arsenic, tungsten, and natural gas increased in 1975. Tin accounted for 58% of the total mineral export value in 1975 compared with 60% in 1974. The tin portion of the total export market increased to 34% from 31% in 1974.

The relation of mineral trade to total trade for 1973–75 is shown in the following tabulation:

	Value (million dollars)	
	Mineral commodity trade	Total commodity trade
Exports (f.o.b.):		
1973	154	268
1974	266	504
1975 [p]	217	420
Imports (f.o.b.):		
1973	NA	246
1974	NA	[e] 349
1975	NA	NA

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

Table 2.—Bolivia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS [1]			
Antimony:			
In ore and concentrate	14,779	13,060	United States 7,450; Switzerland 4,920.
As metal and in alloys	21	--	
Arsenic, white	--	8	All to Chile.
Bismuth:			
In ore and concentrate	569	121	Belgium-Luxembourg 678.
As metal and in alloys		575	
Cadmium in zinc ore and concentrate	56	110	United States 100.
Copper in ore and concentrate	8,230	7,917	Japan 7,226.
Gold metal troy ounces	30	NA	
Iron in ore and concentrate	10,364	--	
Lead in ore and concentrate	20,152	19,353	United States 12,598; United Kingdom 5,015.
Manganese in ore	193	154	All to Argentina.
Silver in ore and concentrate thousand troy ounces	5,281	5,769	United States 3,443; United Kingdom 1,013; Belgium 807.
Tin:			
In ore and concentrate	21,544	28,955	United Kingdom 7,662; United States 7,425; West Germany 2,883.
In smelter products do	6,757	--	
Tungsten in ore and concentrate	1,742	2,049	United States 1,070; Switzerland 947.
Zinc in ore and concentrate	49,568	48,600	United States 31,203; Japan 12,933.
NONMETALS			
Barite	--	3,851	All to Argentina.
Gypsum	1,400	3,251	Brazil 3,103.
Stone: Calcite	105	83	All to Japan.
Sulfur, elemental	56,393	41,769	All to Chile.
MINERAL FUELS AND RELATED MATERIALS			
Natural gas million cubic feet	55,415	54,593	All to Argentina.
Petroleum, crude thousand 42-gallon barrels	11,844	10,799	Argentina 4,408; United States (including Puerto Rico) 2,472; Chile 1,504.

[1] All data on metal exports are in terms of metal content of material shipped except for arsenic, which is reported in gross weight of white arsenic.

Table 3.—Bolivia: Exports of tin

(Metric tons of contained tin)

	1973	1974	1975
Tin in concentrates:			
Corporación Minera de Bolivia (COMIBOL)	14,598	15,222	14,310
Medium Miners Association	4,537	3,831	3,273
Banco Minero de Bolivia (BAMIN)	2,408	2,833	1,361
Smelter products:			
Refined metal and solder	6,405	7,009	7,497
Volatilization products	460	38	--
Total	28,408	28,933	26,441

COMMODITY REVIEW

METALS

Antimony.—The antimony smelter adjacent to the tin smelter at Vinto was completed in October. Some technical problems developed during production trials that would limit operations to about 40% of capacity. The plant is rated at an annual capacity of 4,270 tons of antimony metal, 1,000 tons of antimony alloys, and 1,000 tons of antimony trioxide.

Empressa Minera Unificada S.A. (EMUSA) is the largest Bolivian antimony producer, processing about 1,200 tons per day of ore grading about 4% antimony. EMUSA plans to increase efficiency at the Chilcobija mine and increase mill capacity by 50% at the Caracota mine.

Bismuth.—With the completion of COMIBOL's new refinery in early 1976, Bolivia will become the leading world producer of refined bismuth. Plant capacity is 600 tons per year. COMIBOL's proved and probable reserves are 8,400 tons of bismuth.

Gold.—Gold production in Bolivia has more than doubled since 1972, responding to the increase in international prices. The mining cooperatives and South American Placers Inc. (SAPI) operate concessions on the Tipuani and Kaka Rivers, which are nearing depletion. In 1975 SAPI provided 58% of total gold production, the cooperatives, 41%, and COMIBOL, 1%. Gold production has been largely maintained for internal consumption.

Lead and Silver.—A U.S. company, S. J. Groves, planned to open a new lead-silver mine, the Cascabel, in late 1976 with production slated at 2,800 tons of lead per year. ENAF and COMIBOL formed a joint venture to construct a lead-silver smelter with a capacity of 25,000 tons of lead and 150 tons of silver. COMIBOL estimated its reserves at 52,000 tons of lead and 1,900 tons of silver.

Tin.—Of the 28,720 tons of tin in concentrates produced in 1975, COMIBOL contributed 20,956 tons, the Medium Miners 5,887 tons, and the Small Miners 1,877 tons. Of COMIBOL's total proluction, its mines accounted for 77%; leased mines, 16%; purchases, 5%; and volatilization, 2%.

COMIBOL estimated its cost to produce and market its tin at $3.02 per pound, down from $3.24 in 1974. Mining and depreciation costs were $1.59, export taxes were 21 cents, royalties were 55 cents, and handling, transportation. insurance, and smelting was 67 cents. The drop in cost of 6.9% from the 1974 level was the result of a reduction in royalties to prevent the closure of marginal mines.

COMIBOL's output of about 5.5 million tons of ore, including purchased ore, assaying about 0.7% tin, was treated in concentration plants for an overall tin recovery of 54% contained in a tin concentrate.

COMIBOL estimated its measured, indicated, and inferred, underground reserves of tin ore at 19.3 million tons assaying 1.05% tin. In addition another 179 million tons of alluvial and dump material grading 0.19% tin exist on the surface.

In December ENAF completed the first phase of expansion of its Vinto smelter to 11,000 tons. By yearend 1978 the second phase, bringing total capacity to 20,000 tons, is expected to be completed. In addition, construction of the low-grade tin smelter was scheduled to begin in early 1976. Upon completion in 1978 the facility will process the tin product from the volatilization plant near Potosi.

Bolivian tin production was severely affected by the world economic slowdown, not only in lower tin prices but in higher costs for imported mining equipment and materials. On April 18 the first export control quarter imposed by the International Tin Council began; Bolivia's 1975 quota was 17,078 tons.

Tungsten.—International Mining Co., the largest tungsten producer, planned to expand the capacity of several mines and to install a plant to treat tailings dumps. There are about 5 million tons of tailings containing about 0.1% tungsten. COMIBOL, the second largest producer, planned to increase production at Kami, which was worked by cooperatives. All of COMIBOL's tungsten production comes from cooperatives.

Zinc.—Of the total zinc production of 47,114 tons, COMIBOL supplied 67%, the Medium Miners 32%, and the Small Miners, 1%. Klockner Industries Anlagen began a feasibility study for a 65,000-ton-per-year zinc smelter. Proved reserves of 658,000 tons of contained metal and an additional 962,000 tons of probable reserves would be mined as feed material for the smelter. Diamond drilling at COMIBOL's Matilde mine and exploratory work at New Jersey Zinc Co.'s Huari Huari mine could add to reserves. The Huari Huari mine is scheduled to come onstream in 1976.

COMIBOL's new flotation process at Colquiri, due onstream in early 1976, has a capacity of 19,000 tons of 45% zinc concentrate.

NONMETALS

The most important nonmetallic mineral was sulfur, the production of which fell almost 50% in 1975. The production of calcite was little changed at 85 tons. A U.S. company, Baroid Div. of NL Industries Inc., planned to build a barite and bentonite beneficiation plant in Oruro. Measured and indicated reserves of bentonite are 148,000 tons, and of barite, 320,000 tons. The domestic oil and gas industry has generated great demand for these materials. Salt was mined for local consumption.

MINERAL FUELS

Petroleum and Natural Gas.—Petroleum production decreased from 16,603,014 barrels in 1974 to 14,732,514 barrels in 1975, a decrease of 11.3%. The number of producing wells decreased from 259 to 252 during the year. All producing fields except the Río Grande and Camatindi Fields showed production decreases. No successful exploration wells were drilled during the year, but two development wells at La Peña came in late in the year.

Natural gas production fell in 1975 to 137,297 million cubic feet from a 1974 level of 144,128 million cubic feet. This decrease of 3.4% in production includes injected, flared, consumed, and exported gas. There were 247 producing wells in 16 fields in 1975. The fields showing the largest drop in production were Río Grande, Colpa, and Caranda. Seven new fields were added, mainly in the south.

Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) exported 8.3 million barrels of petroleum valued at $111 million in 1975 compared with 10.8 million barrels valued at $164 million in 1974. Argentina was Bolivia's major customer, followed by the United States and Ecuador. Bolivia received a premium average price of $13.45 per barrel for its sulfur-free, light oil in 1975.

In addition, YPFB exported 54,966 million cubic feet of natural gas valued at $42.5 million compared with 54,593 million cubic feet valued at $29.2 million in 1974. All the gas went to Argentina in 1975. The price of natural gas to Argentina was $0.82 per thousand cubic feet, up from $0.65 per thousand cubic feet in 1974.

Domestic consumption of liquid hydrocarbons increased 21% over that of 1974 to 6,673,171 barrels. The largest increases were noted for high octane gasoline (65%) and diesel oil (28%). Consumption of regular gasoline decreased. Consumption of natural gas increased from 5,946 million cubic feet in 1974 to 7,045 million cubic feet in 1975. Future domestic consumption could go up sharply if planned industrial projects are realized especially the Mutún iron-steel complex and a petrochemical complex. The existing gasline to Argentina and planned gasline to Brazil will provide the largest outlets for Bolivian gas.

Table 4.—Bolivia: Crude petroleum production by YPFB, by field
(Thousand 42-gallon barrels)

Field	1974	1975 p
Rio Grande	4,562	4,578
Monteagudo	2,978	2,471
La Peña	2,582	2,069
Caranda	2,034	1,527
Colpa	1,700	1,363
Camiri	602	566
Tatarenda	301	235
Caigua	1,651	1,568
San Alberto	70	58
Bermejo-Toro	100	83
Camatindi	20	28
Other [1]	3	185
Total	16,603	[2] 14,732

p Preliminary.
[1] Includes production from Tigre, Guairuy, Buena Vista, and Los Monos Fields.
[2] Data may not add to total shown because of independent rounding.
Source: Yacimientos Petrolíferos Fiscales Bolivianos.

Table 5.—Bolivia: Consumption of petroleum refinery products [1]
(Thousand 42-gallon barrels)

Products	1974 r	1975
Jet fuel	201	316
Gasoline, aviation	128	115
Gasoline, motor	2,056	2,289
Kerosine	1,001	1,052
Diesel oil	849	1,091
Fuel oil	873	910
Lubricants	75	77
Liquefied petroleum gas	238	325

r Revised.
[1] Figures refer to actual civilian and military consumption through sales to consumers, and include YPFB consumption.

Petroleum recoverable reserves were estimated at 145 million barrels at yearend. There were no new discoveries in 1975. Reserves of natural gas were estimated by YPFB to be 4.7 trillion cubic feet. Bolivia has been adding to its gas reserves at the rate of 0.3 trillion to 0.5 trillion cubic feet per year.

YPFB paid Gulf Oil Co. $13,717,153, leaving $48,901,727 outstanding on its debt to Gulf for nationalization of its property in 1969.

YPFB's drilling operations increased from 78,375 feet drilled in 1974 to 110,862 feet drilled in 1975. Ten development wells were completed, including the reconditioning of one well in the Caranda Field. Nine exploratory wells were completed, all but one of which were barren of hydrocarbons.

In the past 3 years Bolivia has succeeded in attracting foreign companies to undertake expensive exploration work. YPFB signed 2 new operation contracts during 1975, bringing the total number to 16, and also opened for bidding 3 new areas, all in the Department of Santa Cruz. Between March 1973 and December 1975, U.S., Canadian, French, and Spanish oil companies have spent over $80 million for exploration. If the discoveries prove to be commercially viable, contractors will receive between 45% and 50% of gross production. Existing exploration contracts cover over 37 million acres on 36% of the potential oil-bearing sedimentary basins of Bolivia. In the remaining 64% of the area YPFB has spent $63 million in the same period.

YPFB has five refineries, four gas plants, one lubricant plant, two refined products plants, and two natural gas pipelines. Construction was underway to increase refinery capacity at the Cochabamba plant to 25,000 barrels per day by 1978. This plant supplies 60% of Bolivia's refinery products. The Santa Cruz refinery was being expanded to 15,000 barrels per day, and a new lubricant plant was being installed at Cochabamba. Also, construction of two pumping stations was undertaken to expand the export pipeline to Arica, Chile, to 50,000 barrels per day.

The Mineral Industry of Brazil

By Orlando Martino [1]

In 1975 Brazil's gross domestic product (GDP) increased by 4% to the equivalent of $111 billion[2] at current prices. There was a small increase in the rate of inflation from 28% in 1974 to 29% in 1975.

Production of minerals in 1975 represented about 2% of the gross national product (GNP) but accounted for 13.3% of the value of Brazilian exports. Iron ore alone accounted for 10.5% of total exports. Brazil was essentially an iron ore producer and continued to rank second after Australia as a worldwide exporter of iron ore.

With considerable inducement from and direct participation by Government, Brazil continued in 1975 to aggressively develop its mineral resources. An estimated $120 million was invested in mineral exploration, and another $350 million was spent on petroleum exploration.

Government Policies and Programs.—Considering recent trade deficits, the Economic Development Council, Brazil's highest economic policymaking body, stated that priority will be given to import substitution under the Second National Development Plan for 1975–79. Priority sectors indicated were in capital goods, steel, nonferrous metals, fertilizers, and petroleum. The Government launched a Steel Plan, a Nonferrous Plan, and a Fertilizer Plan with goals of reaching internal self-sufficiency in some commodities and an export potential in others. The Steel Plan, for example, aimed at doubling steelmaking capacity by 1980 and quadrupling it by 1985. Self-sufficiency in nonferrous metals was planned by 1983. The fertilizer group was a priority investment area because Brazil produced no potash, and little sulfur, and only about 30% of nitrogenous and phosphatic fertilizers were derived from locally produced materials.

The Federal Government, operating through the government-controlled Companhia de Pesquisas de Recursos Minerais (CPRM) and Companhia Vale do Rio Doce (CVRD), has taken a strong lead in developing the minerals industry. In addition, five States, Rio Grande do Sul, Minas Gerais, Goiás, Mato Grosso, and Bahia, have formed exploration mining companies to further the development of their regions.

CPRM continued its diversified program of mineral explorations, geological services, and financial assistance to the private sector for mineral exploration.

In addition to its own exploratory projects, CPRM executed projects in metallics and nonmetallics for the account of the Departamento Nacional do Produção Mineral (DNPM), other Government agencies, State exploration companies, and private companies.

An event of particular significance to CPRM was the promulgation in January 1975 of Decree Law No. 1387 which provided funds for financing mineral exploration by CPRM as well as by Brazilian mining companies.

CVRD, the largest Brazilian mining enterprise, was chiefly an iron ore producer and Brazil's most important earner of foreign exchange. It was also engaged in new ventures leading to the production of bauxite, aluminum, titanium, and phos-

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[1] Physical scientist, International Data and Analysis.

[2] During 1975 there were a series of "minidevaluations," which brought the exchange rate from New Cruzeiros (NCr$)7.44=US$1.00 in December 1974 to NCr$9.02=US$1.00 in December 1975. Conversions were made at the latter rate.

phate fertilizers. CVRD was involved through its subsidiary, Rio Doce Geologia e Mineração (DOCEGEO), in geological studies and economic appraisals of nonferrous metal deposits such as copper, aluminum, zinc, and nickel. DOCEGEO's budget increased from $9.7 million in 1974 to $13.7 million in 1975.

Brazil produced only 20% of its petroleum requirements in 1975, therefore exploration efforts were being greatly accelerated. In October 1975, a change in Government policy was made permitting participation of foreign capital in oil exploration and exploitation under service contracts to further expedite the exploration process.

Of the energy consumed in Brazil, approximately 48% was derived from oil and gas, 25% from wood, 24% from hydroelectric power, and 3% from coal. Only 10% of the electricity produced was based on oil; 90% was from hydroelectric sources.

The Government was also considering energy alternatives such as vegetable alcohol, shale oil, coal, lignite, and natural gas. The State electrical company Centrais Electricas Brasileiras S.A. (ELETROBRAS) was not planning to build additional oil-fired thermal powerplants.

The Government also announced new measures to further reduce petroleum consumption: A 25% increase in the price of gasoline to the equivalent of $1.45 per gallon; the National Alcohol Program to mix up to 20% alcohol with petroleum products; and the requirement that State enterprises reduce their hydrocarbon consumption 5% in 1976, compared with that in 1975.

In response to the sharp rise in oil prices since 1973, the Government has been stimulating more intensive use of hydroelectric power. Work began on the diversion canal for the $3 billion Itaipú dam on the Paraná River that will have an installed capacity of 12,600 megawatts. This joint venture of Brazil and Paraguay was expected to begin operations in 1988.

On June 27, 1975, the Minister of Mines and Energy signed an agreement in Bonn with the Federal Republic of Germany for a 15-year nuclear development program in Brazil estimated to require investments of $10 billion. The nuclear program will provide Brazil with eight 1,300-megawatt reactors as well as uranium enrichment and fuel reprocessing facilities. The first of the reactors would come onstream in 1981 and the last unit in 1990.

In connection with the Transamazonia Highway, the Government began to reevaluate the agricultural development potential of the Amazon Basin and began to focus on industrial development and mineral exploration. Under the new "polamazonia scheme," the plan was to focus development on 12 centers or "poles." The Amazon Basin is known to have significant deposits of bauxite and iron ore. Deposits of gold, tin, and metal sulfides have been found along the Jamanxim River, one of the tributaries of the Amazon River. Exploratory surveys of other areas in the basin indicated the occurrence of manganese, iron ore, diamond, coal, tin, and sulfide minerals.

PRODUCTION

Despite the slowdown in Brazil's high rate of expansion of the last decade and the worldwide recession during 1975, Brazil maintained a high level of mineral production. The output of iron and manganese ore and pellets continued their dominant role. The State-owned CVRD, the world's largest producer and exporter of iron ore, alone achieved an output of 52.2 million tons in 1975, an increase of 345% over the decade.

Brazil continued as the world's leading producer of columbium/pyrochlore, quartz crystal, and beryl, although there was a significant decline in the output of these minerals. There was a 76% decline in the output of quartz crystal.

Commodities which had notable increases in production included: Iron ore and pellets (19%), bauxite (13%), steel (11%), ferrochromium (40%), manganese (20%), zinc ore (30%), and asbestos fiber (19%). Although there was a slight decrease of 3% in output of crude petroleum, the output of refinery products increased 11%.

The total number of workers employed in the mineral production sector in 1974 (including coal but excluding petroleum) was 49,600 of which 9,100, the largest group, was connected with the production of iron ore.

Data on mineral production are shown in table 1.

Table 1.—Brazil: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
METALS			
Aluminum:			
Bauxite, gross weight (dry basis)	703,152	710,800	802,294
Alumina	230,948	[e] 240,000	241,000
Metal, primary	[r] 127,000	126,046	121,400
Antimony, metal content	34	40	27
Arsenic, white	77	18	13
Beryllium, beryl concentrate, gross weight [2]	1,210	640	646
Chromium:			
Crude ore	327,461	424,339	702,167
Concentrate	72,824	88,077	154,465
Columbium and tantalum, ore and concentrate, gross weight:			
Columbite and tantalite	169	92	100
Pyrochlore, concentrate	19,426	17,878	9,737
Copper:			
Mine output, metal content	3,412	3,075	1,922
Metal, smelter (blister)	4,200	2,500	1,308
Gold ... troy ounces	[r] 204,414	188,435	172,038
Iron and steel:			
Ore and concentrate ... thousand tons	[r] 51,705	75,502	89,894
Metal:			
Pig iron, excluding ferroalloys ... do	[r] 5,479	5,816	7,053
Ferroalloys:			
Ferrochromium	[r] 15,492	37,801	52,986
Ferrocolumbium	6,093	6,951	3,996
Ferromanganese	[r] 76,920	79,560	86,850
Ferronickel	[r] 9,507	9,852	9,646
Ferrosilicon	[r] 40,221	52,178	54,276
Ferrosilicomanganese	23,324	32,626	38,828
Other and unspecified	4,454	8,949	9,356
Total	[r] 176,011	227,917	255,938
Steel:			
Crude, excluding castings ... thousand tons	[r] 7,150	7,507	8,308
Semimanufactures, hot rolled ... do	[r] 5,311	5,750	6,925
Lead:			
Mine output, metal content	25,946	25,922	22,365
Metal:			
Primary	38,400	41,686	37,540
Secondary	20,400	21,114	25,184
Manganese ore and concentrate (marketable),[3] gross weight ... thousand tons	1,615	1,789	2,056
Nickel:			
Mine output, metal content	4,122	3,536	3,190
Ferronickel, nickel content	2,700	2,391	2,280
Rare earth, monazite concentrate, gross weight	1,439	1,196	1,450
Silver [4] ... thousand troy ounces	[r] 511	527	235
Tin:			
Mine output, metal content	3,742	3,555	[e] 4,117
Metal, smelter, primary	[r] [e] 4,430	[e] 4,850	6,638
Titanium:			
Ilmenite concentrate, gross weight	[r] 6,400	6,743	4,596
Rutile concentrate, gross weight	178	146	104
Tungsten, mine output, metal content	[r] 926	911	913
Uranium [5]	NA	NA	NA
Zinc:			
Mine output, metal content [e]	32,900	[r] 38,300	50,000
Metal, smelter:			
Primary	[r] 22,300	30,519	31,428
Secondary	[e] 5,000	5,400	8,000
Zirconium concentrate, gross weight, zircon [6]	3,094	2,518	2,925
NONMETALS			
Abrasives, natural, n.e.s., corundum and emery	[r] 16,412	--	--
Asbestos, fiber	44,868	61,871	73,978
Barite:			
Crude	[r] 53,563	60,715	53,676
Beneficiated	66,531	27,601	30,196
Cement, hydraulic (including pozzolanic) ... thousand tons	13,398	14,915	17,437

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
NONMETALS—Continued			
Clays, n.e.s.:			
Bentonite	[r] 44,250	77,118	116,785
Kaolin:			
Crude	515,333	591,348	617,884
Beneficiated	189,245	173,669	172,834
Kyanite	988	752	230
Other:			
Crude	1,744,020	2,014,723	2,385,710
Beneficiated crude	306,495	781,653	866,530
Diamond: [7]			
Gem [e] thousand carats	[r] 56	[r] 127	131
Industrial [e] do	[r] 57	[r] 127	131
Total do	[r] 113	254	262
Diatomite	702	1,096	3,740
Feldspar and related materials:			
Feldspar, crude	90,581	97,292	76,429
Sodalite	222	298	650
Fertilizer materials:			
Crude phosphates, phosphate rock (includes apatite):			
Gross weight	257,042	327,274	406,030
P_2O_5 content	145,446	195,688	207,812
Manufactured:			
Nitrogenous (nitrogen content)	140,292	150,169	160,755
Phosphatic (P_2O_5 content)	337,597	387,349	515,970
Fluorspar:			
Direct shipping ore (sales)	2,857	1,411	61
Beneficiated product (output)	70,705	61,551	63,919
Total	[r] 73,562	62,962	64,080
Graphite, all grades	2,842	5,544	5,260
Gypsum and anhydrite, crude	352,055	395,753	403,847
Lime [e] thousand tons	2,000	2,000	2,000
Lithium minerals:			
Amblygonite	446	171	156
Lepidolite	248	460	468
Petalite	2,380	3,569	3,697
Spodumene	1,052	NA	792
Total	[r] 4,126	4,200	5,113
Magnesite, crude, gross weight	275,233	365,661	439,466
Mica, all grades [2]	1,739	2,613	1,100
Pigments, crude (ocher)	5,432	10,309	7,490
Precious and semiprecious stones, except diamond, crude and worked:			
Agate [2]	1,315	1,520	2,466
Other stones [2]	767	736	717
Quartz, crystal, all grades [2]	[r] 4,369	7,805	1,849
Salt, marine thousand tons	1,855	1,552	2,145
Silica	1,049	879	922
Sodium compounds:			
Caustic soda	200,328	206,342	241,303
Soda ash, manufactured	136,172	153,058	148,133
Stone, sand and gravel:			
Dimension:			
Granite	NA	316,564	NA
Marble	66,887	103,554	130,055
Slate	725	1,250	1,305
Crushed and broken stone:			
Dolomite thousand tons	1,339	1,237	1,654
Limestone do	26,152	25,808	29,588
Quartz [8]	15,694	20,438	25,413
Quartzite:			
Crude	464,728	200,766	276,382
Processed [9]	91,780	116,906	130,502
Sand	1,841,149	1,724,100	2,881,068
Sulfur, elemental, byproduct	[r] 1,354	9,356	19,514
Talc and related materials:			
Talc	96,955	155,371	154,893
Pyrophyllite	40,058	45,813	65,778
Other (agalmatolite)	60,928	104,783	81,478
Vermiculite	46	6	800
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [e]	65,000	88,000	91,000
Coal, bituminous (marketable) thousand tons	3,057	3,117	2,846

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coke:			
Metallurgical, all types ---thousand tons--	r 1,789	1,756	2,204
Gashouse ---do---	r 50	60	e 60
Gas:			
Manufactured, all types ---million cubic feet--	r 14,200	15,291	17,230
Natural:			
Gross production ---do---	41,668	52,540	57,371
Marketed production ---do---	r 8,970	17,587	24,720
Natural gas liquids ---thousand 42-gallon barrels--	1,421	1,699	1,931
Petroleum:			
Crude ---do---	r 63,542	66,452	64,694
Refinery products:			
Gasoline ---do---	79,113	80,430	88,903
Jet fuel ---do---	8,071	9,139	10,636
Kerosine ---do---	6,410	4,271	3,988
Distillate fuel oil ---do---	62,834	68,970	77,229
Residual fuel oil ---do---	87,812	87,198	95,759
Lubricants ---do---	565	962	1,497
Other ---do---	27,620	35,758	41,112
Refinery fuel and losses ---do---	13,576	9,682	11,140
Total ---do---	286,001	296,410	330,264

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

[1] In addition to the commodities listed, molybdenite and bismuth are also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[2] Exports.

[3] Includes nickel contained in ferronickel.

[4] Smelter and/or refined metal.

[5] Revised to none.

[6] Includes baddeleyite-caldesite.

[7] By far the larger part of Brazil's diamond production is not reported statistically; hence, the estimates tabulated are based only on very general market information.

[8] This material apparently includes crude quartz used to produce quartz crystal (listed separately in this table) as well as additional unreported quantities of common quartz.

[9] Produced from a portion of the crude quartzite listed above; quantity of crude quartzite processed was 376,674 tons in 1973 and 76,003 tons in 1974 (1975 not available).

TRADE

Brazil's importance as a world minerals supplier was based on iron ore, manganese, columbium/pyrochlore, beryl, and quartz crystal. In the world market, Brazilian exports of columbium/pyrochlore, beryl, and quartz crystal accounted for 60% or more of the total trade in these commodities. Within Brazil's total export sector iron ore at 10.5% ranked fourth in importance after soybeans, coffee, and sugar as a foreign exchange earner. Exports of iron ore of 72.5 million tons rose sharply in value in 1975 to $921 million, an increase of 61% over those of 1974 and continued as the dominant factor in Brazil's total mineral commodity exports. Iron ore exports were largely to Japan (37%), West Germany (17%), and the United States (12%). Exports of manganese ore were next in importance representing almost 1% of total exports.

While Brazil has been increasing minerals production each year, internal demand outstripped production for a number of commodities, requiring large imports of raw materials. Brazil's trade account swung from relative balance in 1973 to a trade deficit of $4.6 billion in 1974 and of $3.5 billion in 1975. Despite good export performance in 1975, the trade deficit was largely caused by substantial imports of pig iron and steel valued at $1.263 million, nonferrous metals at $370 million, fertilizers at $304 million, and $3.074 million for petroleum and derivatives for a total of $5.011 million which represented 41% of total imports. Brazil imported 40% of its energy requirements. Imported crude oil amounted to 263 million barrels in 1975, an increase of 8.7% over that of 1974.

Brazil did not send an observer to the October meeting in London of the iron ore exporting countries and indicated unwillingness to join an organization which sought to emulate the oil producer's cartel. Previously Brazil stated that it would be opposed to any policy of confrontation advocating instead a cooperative arrangement which included importers as well as exporters of iron ore. Brazilian officials emphasized that Brazil was rapidly and heavily investing in expanding its iron ore output and would be seriously affected by quotas to achieve price levels. It was pointed out further that mining projects had the participation of large multinational iron ore consuming companies, another factor working against a successful cartel.

Data on mineral exports and imports are given in tables 2 and 3.

Table 2.—Brazil: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite and concentrate	4,629	24,192	Mainly to Argentina.
Oxide (alumina) and hydroxide [1]	1,903	4,899	Argentina 3,631; Mexico 986.
Metal including alloys:			
Semimanufactures	138	367	Chile 235; Paraguay 76.
Antimony:			
Metal including alloys, all forms	34	10	All to Nicaragua.
Beryl ore and concentrate	1,210	640	Mainly to United States.
Chromium, chromite	34,924	13,378	Mainly to Japan.
Columbium and tantalum, ore and concentrate:			
Columbite [2]	26	41	All to United States.
Tantalite	133	105	United States 46; Netherlands 35; West Germany 24.
Pyrochlore	6,445	4,344	West Germany 1,696; United States 997; United Kingdom 650.
Copper metal including alloys, all forms	1,925	1,242	Belgium-Luxembourg 630; Argentina 175; Uruguay 135.
Gold metal, unworked or partly worked, all forms troy ounces	1,125	450	Switzerland 320; Spain 129.
Iron and steel:			
Ore and concentrate including roasted pyrite thousand tons	44,963	59,439	Japan 18,718; West Germany 11,760; United States 7,161.
Metal:			
Scrap	65	--	
Pig iron	428,040	252,256	Venezuela 83,167; Japan 60,336; People's Republic of China 46,634.
Sponge iron, powder, shot	155	276	Argentina 108; Uruguay 103; Venezuela 40.
Ferroalloys:			
Ferrochrome	10,372	26,764	United States 9,900; Canada 8,390; Netherlands 7,400.
Ferromanganese	21,413	5,245	Venezuela 2,515; Colombia 2,220.
Ferromolybdenum	186	143	Japan 100; Spain 40.
Ferronickel	3,368	2,929	Mainly to Japan.
Ferrosilicon	3,100	5,724	United States 3,552; Colombia 879.
Other	5,756	11,088	United States 4,871; Netherlands 1,602.
Steel, primary forms	191,236	79,698	Argentina 55,682; Uruguay 11,742; Ecuador 9,216.
Semimanufactures:			
Bars, rods, angles, shapes, sections	124,436	108,282	United States 60,396.
Universals, plates, sheets	103,751	33,208	Uruguay 14,531; Argentina 13,714.
Hoop and strip	351	207	Bolivia 91; Uruguay 36; Paraguay 31.
Wire	2,490	4,897	Colombia 2,497; Venezuela 759; United Kingdom 695.
Tubes, pipes, fittings	5,539	13,996	Bolivia 3,132; Peru 2,853; United States 1,542.
Castings and forgings, rough	1,485	937	Bolivia 320; Paraguay 297; United States 216.
Lead metal including alloys, all forms	229	(3)	Mainly to Paraguay.
Manganese:			
Ore and concentrate thousand tons	788	1,493	United States 688; Norway 253.
Oxides	--	272	Mainly to Argentina.
Mercury 76-pound flasks	1	(3)	Do.
Molybdenum:			
Ore and concentrate	38	--	
Metal including alloys, all forms kilograms	738	--	

See footnotes at end of table.

Table 2.—Brazil: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Nickel metal including alloys, all forms	3	1	Mainly to Argentina.
Platinum-group metals and silver, including alloys:			
Platinum group ....troy ounces	157,249	305,592	Spain 263,925.
Silver ....do	793,190	1,150,416	France 896,651; Spain 234,732.
Rare-earth metals:			
Ore and concentrate, except monazite	719	949	United States 350; United Kingdom 309; Japan 190.
Oxides	50	10	All to United Kingdom.
Metals including alloys:			
Cerium	185	198	United Kingdom 116; Belgium-Luxembourg 42; Italy 23.
Other	5	--	
Total	190	198	
Tin:			
Ore and concentrate	40	20	All to West Germany.
Metal including alloys, all forms	1,225	2,669	United States 1,637; Argentina 853.
Titanium:			
Ore and concentrate	--	4,930	United States 4,310.
Oxides ....kilograms	100	--	
Metal including alloys, all forms ....do	120	--	
Tungsten:			
Ore and concentrate	1,348	1,389	Netherlands 462; Sweden 425; United States 272.
Metal including alloys, all forms	2	(3)	All to United States.
Zinc:			
Ore and concentrate	--	8,525	All to France.
Oxide	389	10	All to Bolivia.
Metal including alloys, all forms	33	(3)	Mainly to Bolivia.
Other:			
Ore and concentrate, n.e.s	4,809	4,860	United States 4,250; Japan 610.
Ash and residue containing nonferrous metals	--	25	West Germany 15; United States 10.
Oxides, hydroxides and peroxides of metals n.e.s	50	95	France 41; Argentina 12; Chile 11.
Metal including alloys, all forms:			
Pyrophoric alloys ....kilograms	--	103,536	Belgium-Luxembourg 80,000; United Kingdom 13,000.
Waste and sweepings of precious metals ....do	17,250	2,079	All to United Kingdom.
NONMETALS			
Abrasives, natural, n.e.s.:			
Emery	4	4	Mainly to Argentina.
Grinding and polishing wheels and stones	203	188	Japan 56; Colombia 36; Peru 27.
Other	--	1	All to Paraguay.
Asbestos	102	--	
Barite and witherite	47,659	46	All to Trinidad and Tobago.
Boron materials, oxide and acid	1	7	All to United States.
Cement	114,438	120,312	Nigeria 96,952; Guyana 18,238.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	2	203	Mainly to Bolivia.
Kaolin	2,878	3,224	Chile 1,683; Uruguay 1,540.
Other	33	1,201	Mainly to Uruguay.
Products:			
Refractory (including nonclay brick)	4,217	6,867	Argentina 3,886; Peru 1,682.
Nonrefractory	9,310	21,099	Paraguay 7,179; United States 3,639; Republic of South Africa 3,431.
Diamond:			
Gem, not set or strung ....carats	15,945	9,630	United States 3,800; Belgium-Luxembourg 2,275; Netherlands 1,900.
Industrial ....do	11,070	2,455	United States 2,055; Argentina 300.
Diatomite and other infusorial earth ....kilograms	125	--	

See footnotes at end of table.

Table 2.—Brazil: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Fertilizer materials:			
Manufactured:			
Nitrogenous	301	--	
Phosphatic	8,641	2,666	Uruguay 1,436; Paraguay 1,230.
Potassic	240	--	
Other including mixed	9,522	1,672	Mainly to Paraguay.
Ammonia	2	1	All to Bolivia.
Fluorspar	24,936	31,360	U.S.S.R. 21,300; Japan 5,310; Australia 4,200.
Graphite, natural	10	(3)	All to Paraguay.
Lime	20	32	Bolivia 16; Paraguay 6.
Magnesite	25,910	42,594	Argentina 9,695; Spain 7,500; Poland 5,000.
Mica:			
Crude including splittings and waste:			
Lepidolite	--	200	All to Mexico.
Other	1,738	2,613	United States 1,513; West Germany 795.
Worked including agglomerated splittings	1	(3)	Mainly to United States and Japan.
Pigments, mineral:			
Natural crude	--	200	All to Argentina.
Iron oxides, processed	1	12	Chile 5; Paraguay 3; Bolivia 3.
Precious and semiprecious stones, except diamond:			
Crude and worked:			
Agate kilograms	1,314,530	1,519,666	Japan 650,251; United States 436,205; West Germany 275,766.
Amethyst do	314,731	315,856	West Germany 102,160; Japan 67,550; United States 45,563.
Aquamarine do	3,864	1,528	United States 893; West Germany 249; Japan 195.
Cat's eye do	1	2	Mainly to United States.
Citrine do	45,351	24,267	West Germany 8,853; Japan 6,040; Italy 3,879.
Emerald do	11,665	1,963	Switzerland 1,057; United States 276; India 255.
Garnet do	7,339	1,584	France 1,036; Japan 461.
Opal do	701	222	Hong Kong 173; United States 26.
Sapphire do	(3)	1	All to Switzerland.
Topaz do	2,204	1,860	Japan 602; United States 310; France 269.
Tourmaline do	3,670	1,863	Japan 1,260.
Turquoise do	--	51	Mainly to United States.
Other do	377,801	386,992	West Germany 97,157; United States 55,140; Japan 42,901.
Quartz crystal:			
Electronic and optical grade	39	147	Hong Kong 75; Japan 32; West Germany 25.
Other	4,329	7,661	West Germany 3,164; France 1,090; United States 816.
Salt	26	18	All to Paraguay.
Sodium and potassium compounds, n.e.s.	r 3,322	10,773	Mainly to Argentina.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	17,324	49,047	Japan 26,460; Italy 16,804.
Worked	3,325	2,859	Japan 1,991; United States 477.
Dolomite, chiefly refractory grade	1,258	1,495	Mainly to Argentina.
Quartz and quartzite	201	41	Mainly to Belgium-Luxembourg.
Sand, excluding metal bearing	10	101	United States 50; West Germany 30; Netherlands 15.
Sulfur:			
Sulfur dioxide kilograms	68	68	All to Ecuador.
Sulfuric acid, oleum	(3)	4	Paraguay 3; Bolivia 1.
Talc, steatite, soapstone, pyrophyllite	428	489	Colombia 260; Argentina 120; Peru 50.
Vermiculite	30	--	
Other nonmetals, n.e.s.:			
Crude	1	53	All to Argentina.
Slag, dross, and similar waste, not metal bearing:			
From iron and steel manufacture	90	28	Do.
Oxide and hydroxide of barium	32	--	
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	1	3	Mainly to Bolivia.

See footnotes at end of table.

Table 2.—Brazil: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	2	--	
Carbon black	202	--	
Coke and semicoke of coal, lignite or peat	18,352	5	All to Bolivia.
Hydrogen and rare gases ----- kilograms	477	2,296	Uruguay 2,014; Peru 280.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	14,851	12,102	Italy 7,131; Bahamas 4,214.
Refinery products:			
Gasoline:			
Aviation ----- do	57	--	
Motor ----- do	95	175	Peru 144; Uruguay 31.
Jet fuel ----- do	75	159	All to Peru.
Kerosine ----- do	625	282	Trinidad and Tobago 156; Uruguay 126.
Distillate fuel oil ----- do	12,230	816	Uruguay 352; Chile 212; Peru 130.
Residual fuel oil ----- do	105	1,701	Japan 809; United States 506; Chile 312.
Lubricants (including grease) do	(3)	(3)	Mainly to Argentina.
Other:			
Liquefied petroleum gas do	239	169	Argentina 77; Uruguay 60; Surinam 32.
Mineral jelly and wax do	38	(3)	All to Uruguay.
Bitumin ----- do	--	9	Mainly to Bolivia.
Bituminous mixtures ----- do	(3)	4	Mainly to Mozambique.
Pitch ----- do	49	12	All to Argentina.
Not specified ----- do	(3)	65	France 54; Italy 11.
Total ----- do	13,513	3,392	
Mineral tar, and other coal-, petroleum-, or gas-derived crude chemicals	40	--	

r Revised.
1 Includes alumina gel.
2 Includes some tantalum.
3 Less than ½ unit.

Table 3.—Brazil: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	8,292	15,120	Guyana 8,049; United States 5,071; Japan 2,000.
Oxide (alumina) and hydroxide	1,708	1,930	West Germany 1,004; United States 653.
Metal including alloys:			
Scrap	4,987	5,593	United States 4,231; Canada 1,018.
Unwrought	49,839	81,388	Canada 16,087; France 12,218; United States 10,366.
Semimanufactures	12,778	16,676	United States 7,270; West Germany 1,747.
Antimony:			
Ore and concentrate	452	1,738	Bolivia 494; Thailand 487; Morocco 286.
Metal including alloys, all forms	128	209	Netherlands 68; United Kingdom 37; Belgium-Luxembourg 36.
Arsenic:			
Trioxide, pentoxide, acids	723	851	France 536; United States 173; Mexico 100.
Metal including alloys, all forms	31	--	
Beryllium metal including alloys, all forms kilograms	51	(1)	Mainly from Switzerland.
Bismuth metal including alloys, all forms	20	26	Mexico 15; United States 5; West Germany 3.
Cadmium metal including alloys, all forms	102	176	Mexico 110; Netherlands 24.
Chromium:			
Chromite	11,554	30,686	Philippines 26,543; Republic of South Africa 3,696.
Oxide and hydroxide	282	394	West Germany 134; Poland 112; U.S.S.R. 97.
Metal including alloys, all forms	29	39	Japan 19; United States 16.
Cobalt:			
Oxide and hydroxide	92	82	Belgium-Luxembourg 58; United States 24.
Metal including alloys, all forms	217	198	Belgium-Luxembourg 141; United States 50.
Columbium and tantalum, tantalum metal including alloys, all forms kilograms	61	46	United States 36; Austria 6.
Copper:			
Copper sulfate	3,751	9,693	United Kingdom 2,544; Peru 2,246; Mexico 1,278.
Metal including alloys:			
Scrap	997	4,573	Mainly from United States.
Unwrought	94,517	131,903	Chile 37,536; Zambia 26,739; United States 21,949.
Semimanufactures	1,492	3,048	United States 1,181; West Germany 875; United Kingdom 322.
Gold metal unworked or partly worked troy ounces	107,641	47,133	United Kingdom 11,799; United States 11,317; Canada 8,359.
Iron and steel:			
Ore and concentrate	305	52	Mainly from Netherlands.
Metal:			
Scrap	21,763	37,306	United States 21,743; Surinam 6,628; Belgium-Luxembourg 5,000.
Sponge iron, powder, shot	6,481	7,987	United States 4,171; West Germany 1,903; Japan 1,538.
Ferroalloys	6,766	14,875	France 1,994; Japan 1,500.
Steel, primary forms	418,700	642,847	Japan 309,875; United States 258,023; Bulgaria 24,991.
Semimanufactures:			
Bars, rods, angles, shapes, sections	183,390	658,082	Japan 175,978; West Germany 153,860; Argentina 86,072.
Universals, plates, sheets thousand tons	1,004	2,549	Japan 790; West Germany 718; United States 519.
Hoop and strip	31,800	94,326	West Germany 60,746; Japan 15,527.
Rails and accessories	78,005	99,499	United States 70,927; Japan 13,946.
Wire	22,623	44,985	Argentina 17,574; Japan 9,503; West Germany 8,122.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Semimanufactures—Continued			
Tubes, pipes, fittings	49,301	106,451	West Germany 35,260; United States 25,892; Japan 11,236.
Castings and forgings, rough	792	3,005	Belgium-Luxembourg 1,221; West Germany 925; Japan 500.
Ingot, high carbon, alloy steel	48	1,553	Mainly from Canada.
Lead:			
Oxides	1,651	1,292	West Germany 903; United States 181.
Metal including alloys, all forms	27,726	20,367	United States 9,840; Mexico 8,833.
Magnesium metal including alloys, all forms	9,552	12,003	United States 7,886; Norway 3,785.
Manganese:			
Ore and concentrate	9,289	12,205	Gabon 7,594; United States 2,612.
Oxides	1,165	1,542	Japan 1,080; United States 247; Belgium-Luxembourg 195.
Metal	245	332	Japan 150; Republic of South Africa 88; United States 43.
Mercury ......76-pound flasks	3,741	5,442	Mainly from Mexico.
Molybdenum:			
Ore and concentrate	1,069	1,401	United States 904; Canada 412.
Metal including alloys, all forms	22	38	United States 17; Netherlands 11; Austria 8.
Nickel:			
Matte, speiss, similar materials	(1)	--	
Metal including alloys:			
Scrap	--	10	All from United States.
Unwrought	1,642	3,209	United States 1,542.
Semimanufactures	863	1,782	United States 823; France 374; Sweden 255.
Platinum-group metals including alloys, all forms:			
Platinum ......troy ounces	8,198	6,366	United States 4,244; West Germany 1,382.
Other including all alloys thousand troy ounces	r 53	34	United States 17; West Germany 12.
Rare-earth metals ......kilograms	4,614	--	
Selenium, elemental	20	--	
Silicon metal	2,231	--	
Silver metal including alloys thousand troy ounces	3,964	3,764	West Germany 1,945; United States 785; Peru 449.
Sodium metal	13	30	Mainly from West Germany.
Tellurium, elemental	r 1	--	
Tin:			
Ore and concentrate	3,214	6,015	Bolivia 4,632; Singapore 781.
Oxides	93	160	United Kingdom 97; West Germany 61.
Metal including alloys, all forms	11	10	Mainly from United States.
Titanium:			
Ore and concentrate:			
Ilmenite	37,765	35,880	All from Australia.
Rutile	2,310	3,213	Netherlands 1,596; Australia 1,275.
Oxides	2,173	3,299	West Germany 1,634; France 502.
Metal including alloys, all forms	31	41	United States 28; Italy 6.
Tungsten metal including alloys, all forms	25	33	United States 16; Netherlands 5.
Uranium and thorium:			
Oxides including rare-earth oxides	94	162	United States 138.
Metals including alloys, all forms kilograms	(1)	--	
Vanadium:			
Oxides	r 281	560	Republic of South Africa 412; France 60.
Metal including alloys, all forms	6	26	Mainly from United States.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Zinc:			
Ore and concentrate	--	24,237	Canada 14,552; United States 9,685.
Oxide	259	192	United States 92; West Germany 80; France 20.
Metal including alloys:			
Unwrought	77,558	63,468	United States 12,687; Peru 11,439; Belgium-Luxembourg 10,409.
Semimanufactures	282	267	United Kingdom 82; Norway 60; Denmark 37.
Zirconium and hafnium:			
Ore and concentrate	6,247	7,891	Austria 6,131; United States 787.
Metal including alloys, all forms	1	1	Mainly from West Germany.
Other:			
Ash and residue containing nonferrous metals	3,001	2,022	United States 1,230; Canada 349; Nigeria 210.
Oxides, hydroxides, and peroxides of metals, n.e.s	1,516	1,793	West Germany 581; United States 472; Belgium-Luxembourg 211.
Waste and sweepings of precious metals kilograms	32	26	West Germany 20; Italy 6.
Metals including alloys, all forms:			
Alkali and alkaline earth metals, n.e.s do	88	7	Mainly from Mexico.
Pyrophoric alloys	3	6	Mainly from France.
Base metals including alloys, all forms, n.e.s	2	2	Mainly from United States.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	1,525	1,157	Italy 588; United States 530.
Dust and powder of precious and semiprecious stones kilograms	136	196	United States 137; Ireland 39.
Grinding and polishing wheels and stones	369	801	West Germany 417; United States 170.
Asbestos	21,881	38,621	Canada 22,187; Republic of South Africa 10,399.
Barite and witherite	123	129	United States 69; West Germany 60.
Boron materials:			
Crude natural borates	10,886	18,138	Argentina 6,714; Netherlands 5,720; Turkey 4,802.
Oxide and acid	3,564	2,779	United States 1,585; Argentina 709; West Germany 322.
Bromine	5	35	United States 18; Israel 16.
Cement	235,677	243,439	Uruguay 173,884; U.S.S.R. 21,912.
Chalk	3,951	3,014	France 1,293; Belgium-Luxembourg 705; Sweden 634.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	19,263	17,685	United States 10,464; Argentina 7,207.
Fire clay	1,063	--	
Kaolin	10,831	20,514	Mainly from United States.
Andalusite, kyanite, sillimanite	186	160	United States 109; West Germany 29; Argentina 20.
Other	2,493	2,438	United States 1,796; Japan 500.
Products:			
Refractory (including nonclay brick)	20,949	68,553	West Germany 28,760; Japan 24,717; United States 10,583.
Nonrefractory	1,537	2,616	Italy 1,412; Spain 835; Uruguay 323.
Cryolite and chiolite	1,722	2,190	All from Denmark.
Diamond:			
Gem, not set or strung[2] carats	320,000	425,000	Mainly from Belgium-Luxembourg.
Industrial do	185,000	375,000	United States 170,000; Ireland 95,000; United Kingdom 60,000.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Diatomite and other infusorial earth	1,347	1,578	United States 721; West Germany 551.
Feldspar	20	32	Netherlands 21; West Germany 12.
Fertilizer materials:			
Crude			
Nitrogenous	28,800	26,839	All from Chile.
Phosphatic	933,043	1,310,537	United States 547,498; Morocco 538,188; Tunisia 142,963.
Potassic	(1)	--	
Manufactured:			
Nitrogenous	653,487	876,396	West Germany 285,631; Netherlands 212,986; United States 141,341.
Phosphatic:			
Thomas slag	25,562	51,555	Belgium-Luxembourg 23,958; West Germany 21,097; Egypt 5,500.
Other	513,149	751,410	United States 399,343; Spain 90,312.
Potassic	878,721	1,031,441	Canada 393,479; United States 220,404; West Germany 146,065.
Other including mixed	391,795	457,129	United States 389,275.
Ammonia	56,654	91,794	United States 35,353; Iran 21,547; Uruguay 12,348.
Fluorspar	104	62	United States 36; United Kingdom 20; Netherlands 6.
Graphite, natural	103	182	United Kingdom 100; West Germany 53; Malagasy Republic 26.
Gypsum and plasters	2,076	4,133	Bolivia 3,400; United Kingdom 523.
Iodine	75	84	Chile 62; Belgium-Luxembourg 8.
Lime	--	203	Belgium-Luxembourg 100; Venezuela 73; Uruguay 30.
Lithium minerals	28	68	Argentina 40; United States 28.
Magnesite	32	18	West Germany 14; Netherlands 5.
Mica:			
Crude including splittings and waste	10	8	Denmark 5; United States 3.
Worked including agglomerated splittings	34	45	United States 16; France 15; Switzerland 12.
Phosphorus, elemental	97	--	
Pigments, mineral, including processed iron oxides	2,522	2,776	West Germany 2,009; Argentina 327.
Precious and semiprecious stones, except diamond [3] ... kilograms	r 1,465	927	West Germany 696; Switzerland 109.
Pyrite, gross weight	106	277	West Germany 192; United States 85.
Salt and brine	45	126	Bolivia 90; United Kingdom 22.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	262,442	326,768	United States 131,431; France 55,937; Netherlands 34,024.
Caustic potash, sodic, potassic peroxides	3,337	3,697	France 1,466; United States 1,326.
Sodium carbonate (soda ash)	43,022	44,916	Romania 16,906; Japan 8,100; Belgium-Luxembourg 4,524.
Sodium sulfate	71,506	63,809	Mexico 52,041; Sweden 10,339.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	6,428	3,032	Paraguay 2,000; Argentina 587; Italy 401.
Other	79	24	Uruguay 19; West Germany 5.
Worked	159	233	Argentina 59; Italy 57.
Dolomite, chiefly refractory grade	2,500	2,640	Mainly from Italy.
Gravel and crushed rock	215	211	France 173; Paraguay 35.
Limestone (except dimension)	--	85	All from West Germany.
Quartz and quartzite	380	491	Belgium-Luxembourg 248; West Germany 182; United States 61.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Stone, sand and gravel—Continued			
Other	1,492	302	United States 249; Argentina 46.
Sulfur:			
Elemental:			
Other than colloidal	455,337	611,128	United States 410,667; Mexico 76,012; Canada 75,912.
Colloidal	237	217	United States 192; West Germany 19.
Sulfur dioxide	46	160	Mainly from West Germany.
Sulfuric acid, oleum	66,353	111,863	Norway 47,781; West Germany 16,639; Portugal 16,322.
Talc, steatite, soapstone, pyrophyllite	177	132	United States 63; West Germany 25; Austria 23.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum	(1)	--	
Other	50	148	Japan 100; United Kingdom 20.
Slag, dross, and similar waste, not metal bearing	1,752	472	West Germany 395; Republic of South Africa 77.
Oxides and hydroxides of magnesium, strontium, barium	2,436	1,335	United States 567; Japan 461.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	60	34	Mainly from United Kingdom.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,011	938	Mainly from United States.
Carbon black	19,141	23,478	United States 10,560; Argentina 5,439.
Coal, all grades including briquets thousand tons	1,700	1,602	United States 1,241; Poland 351.
Coke and semicoke	122,353	211,000	West Germany 155,878; Belgium-Luxembourg 24,080.
Hydrogen and rare gases	16	12	United States 7; West Germany 3.
Peat, including peat briquets and litter	13	12	Mainly from West Germany.
Petroleum:			
Crude thousand 42-gallon barrels	236,304	241,776	Saudi Arabia 121,294; Iraq 55,871; Libya 22,898.
Refinery products:			
Gasoline do	2,151	4,190	Netherlands Antilles 1,174; Turkey 530; U.S.S.R. 487.
Kerosine do	193	--	
Distillate fuel oil do	187	328	U.S.S.R. 190; Algeria 138.
Residual fuel oil do	631	140	All from Venezuela.
Lubricants (including grease) do	2,901	3,368	United States 1,730; Netherlands Antilles 782.
Other:			
Liquefied petroleum gas do	1,815	2,387	Venezuela 1,080; Saudi Arabia 738; Kuwait 243.
Naphtha do	10,524	8,753	Kuwait 3,898; Saudi Arabia 1,680; Netherlands Antilles 1,550.
Mineral jelly and wax do	r 52	162	Japan 41; United States 33; Singapore 26.
Bitumen and other residues, and bituminous mixtures, n.e.s do	113	28	United Kingdom 18; United States 8.
Pitch, pitch coke, petroleum coke do	340	466	United States 439.
Other do	72	127	Mainly from United States.
Total do	r 18,979	19,949	
Mineral tar and other coal-, petroleum- or gas-derived crude chemicals	133,008	171,632	United States 91,342; Netherlands Antilles 49,782; Venezuela 26,392.

r Revised.
[1] Less than 1/2 unit.
[2] Partial figure, quantity reported valued at $651,229 in 1973 and $1,473,765 in 1974. Total imports include unspecified quantities valued at $5,358 in 1973 and $1,642 in 1974.
[3] Partial figure, quantity reported valued at $402.791 in 1973 and $389,019 in 1974. Total imports include unspecified quantities valued at $52,448 in 1973 and $53,690 in 1974.
Exchange rate: 1973—6,128 new cruzerios per US$1.00; 1974—6,843 new cruzerios per US$1.00.
Source: United Nations Commodity Trade Summaries. Comercio Exterior do Brazil 1973 and 1974. V. 1. 1973 No. 4; 1974 No. 39.

COMMODITY REVIEW

METALS

Despite a varied and substantial mineral resource base, Brazil had not achieved self-sufficiency in aluminum, lead, copper, zinc, nickel, and tin. In January 1975, the Government of Brazil announced a 10-year plan requiring investment of $5.3 billion for developing the country's nonferrous metal industries as part of its import substitution program. The objective of the plan was to become self-sufficient in supplies of copper, lead, and zinc, with an exportable surplus of aluminum, nickel, and tin.

Aluminum.—Brazil was in the process of exploiting its potential for becoming a leading producer and exporter of bauxite and aluminum because of large deposits, estimated to be in excess of 3 billion tons, and the hydroelectric potential in the Amazon region.

Output of bauxite increased 13% in 1975 ranking Brazil 15th among world producers. All of the country's output of bauxite came from limited reserves of three major companies in Minas Gerais. Although imports of aluminum increased markedly in 1975, this situation was expected to reverse itself by the end of the decade. According to Brazil's new nonferrous metal plan, total aluminum output of 1.4 million tons per year was planned for 1983.

A number of national and foreign entities were actively exploring bauxite deposits in the Trombetas area east of Manaus and north of the Amazon River. Although the Trombetas bauxite was first discovered by Aluminum Company of Canada Ltd. (ALCAN) geologists in 1966, mining and investment plans were initiated only recently.

By late 1975 financing arrangements were completed for the Trombretas project of Mineração Rio do Norte S.A. The firm, established in June 1974, is an international consortium of CVRD and Companhia Brasileira de Alumínio (CBA) (of the Votorantim Group) each with shares of 41% and 10%, respectively, Alcan Aluminium Ltd. with a 19% interest, and six other partners each with a 5% interest.

The Mineração Rio do Norte project was estimated to cost $260 million, up from the 1971 capital cost estimate of $90 million, for a 3.35-million-ton-per-year facility for crushing, washing, and drying. It included a self-sufficient community for 3,000 people as well as a shipping port on the Trombetas River north of the bauxite deposits. One million tons of bauxite were scheduled for shipment to foreign partners in 1978, 3 million tons in 1979, and 3.35 million tons per year thereafter. Plans were being developed to increase production to possibly 8 million tons per year by the early 1980's.

During the year financial negotiations continued relative to the agreement signed on September 17, 1974, creating Alumínio do Brazil S.A. (ALBRAS), owned 51% by CVRD and 49% by the Light Metal Smelters Association of Japan with the participation of Nippon Light Metals Company, Ltd., Showa Denko K.K., Sumitomo Chemical Co., Ltd., Mitsubishi Chemical Industries Limited, and Mitsui Aluminium Co., Ltd. ALBRAS planned to construct a major alumina-aluminum complex 40 kilometers southwest of Belém and 1,028 kilometers away by barge from the Trombetas bauxite source to the west.

The complex estimated to cost $3 billion included a 1.3-million-ton-per-year alumina plant, a 640,000-ton-per-year aluminum smelter, and a 2,700-megawatt hydropower plant on the Tocantins River, 350 kilometers south of Belém. By yearend the Japanese group was negotiating to scale down the ALBRAS project to a 320,000-ton-per-year smelter with a proportionate reduction in the alumina plant.

To meet Brazil's growing demand for aluminum, plans were made to expand four existing smelters that have a total capacity of 130,000 tons of primary aluminum per year. The 30,000-ton plant at Poços de Caldas operated by Companhia Mineira de Alumínio (ALCOMINAS) (with 51% Alcoa interest) was being doubled in size. CBA was also doubling its 45,000-ton plant at Sorocaba. By the second half of 1975, ALCAN expanded its wholly-owned aluminum smelter at Aratú near Salvador, Bahia from 14,500 to 28,100 tons per year. A further expansion to 56,200 tons per year was foreseen by 1977. ALCAN's other Brazilian smelter at Saramenha was planned for expansion from 32,000 to 60,000 tons by 1978.

Beryllium.—Brazil was one of the most important sources of beryl among market economy countries. Most of the beryl was exported to the United States and in smaller quantities to Japan. Brazil supplied 50% of the beryl imported into the United States.

All beryl output was from small operators who selectively mine pegmatite deposits, mainly in the States of Minas Gerais, Paraíba, Bahia, and Rio Grande do Norte. The State of Minas Gerais has been the leading producer with an output fluctuating between 45% and 75% of the country's total.

Chromite.—Brazil has become a significant exporter of ferroalloys. Exports have increased from 17,700 tons in 1970 to 61,000 tons in 1975; one-half of the tonnage was accounted for by ferrochromium. The largest domestic producer of beneficated chromite and low- and high-carbon ferrochromium was Companhia de Ferro-Ligas da Bahia, S.A. (FERBASA).

Chromite reserve are located principally in Bahia and are estimated to contain 30 million tons of 40% Cr_2O_3. FERBASA operated two mines near Campo Formoso, 470 kilometers northwest of Salvador. In a separate project, FERBASA was moving forward in a joint venture with a group of Japanese firms which plan to produce 1.5 million tons of concentrates over a 10-year period.

Columbium.—Brazil maintained its dominant position as the world's leading producer of columbium minerals, accounting for about 85% of world mine production. The country's leading producer was Companhia Brasileira de Metalurgia e Mineração (CBMM), owned 50.5% by the Moreira Salles group, 33.5% by Molybdenum Corp. of America and 16% by Pato Consolidated Gold Dredging Ltd. CBMM continued to recover columbium concentrate from pyrochlore ores at its Araxá mines in Minas Gerais and to produce ferrocolumbium by the thermite process at its pyrometallurgical plant. The principal market for exports of the concentrate and the alloy was the United States.

During 1975 CBMM facilities at its three open pit mines and plant at Araxá were undergoing expansion to increase production from 20,000 to 36,000 tons per year of pyrochlore concentrate by yearend 1976. The expansion of the metallurgical plant was completed in 1974, increasing capacity to 12,000 tons per year of ferrocolumbium.

Total ore reserves of the Araxá deposit were estimated by CBMM at almost 400 million tons containing 3% to 4% Cb_2O_5, making it the largest pyrochlore ore body in the world. This was a minimum estimate since the extent of the deposit had not been fully determined.

Copper.—The only important copper mine in operation, Camaqua in Rio Grande do Sul was operated by Companhia Brasileira de Cobre, S.A. (CBC), and produced about 225,000 tons of ore in 1975 containing less than 1% copper. This company also operated a smelter and refinery at Itapeva, São Paulo.

During 1975, CPRM completed exploration of the Vale do Curaçá copper deposit in the copper region of Northern Bahia. Reserves were estimated at 100 million tons of ore averaging 1% copper content.

Although the State of Bahia has 80% of Brazil's copper reserves, their exploitation continued to be delayed. Reserves at the Caraíba deposit in Bahia were estimated at 45 million tons of ore grading 1.3% copper. In 1975 a State-owned company assumed control of Caraíba Metais S.A., part of the Grupo Minero Pignatari, which had been set up to exploit this deposit. It was estimated that production in this area would not begin in less than 5 years.

The Government made preliminary plans to build one or possibly two copper smelters using primarily imported concentrates. Late in 1975 missions were sent to Chile and Peru to formalize import agreements with these countries.

With Brazil's large electrical power program, there was a critical need for copper, which was given the highest priority in the Nonferrous Plan. Imports of copper ran about 72% of consumption and were a factor in Brazil's unfavorable trade balance. Refined copper consumption was 155,200 tons in 1975, a decrease from 173,900 tons in 1974. For the immediate future Brazil was expected to remain heavily dependent on imports.

Iron Ore.—Brazil had remained the leading producer of iron ore in Latin America since 1964 when it surpassed Venezuela. Production of iron ore in 1975 reached a new record, 19% over that of 1974.

Brazil was also a major worldwide exporter of iron ore and ranked second to Australia. Exports increased sharply in value in 1975 to $921 million, an increase of 61% over those of 1974. The price of iron ore increased by 33% to $12.92 per ton. Within Brazil's export sector, iron ore ranked fourth in importance as a foreign exchange earner. Brazil had a major position in world iron ore with reserves estimated at 26 billion tons, which includes the most recently discovered deposits in the Serra dos Carajás. CVRD, organized in 1942 and 80% owned by the Government, was the most important organization in Brazilian mining and the world's largest producer and exporter of iron ore, a position achieved in 1974. In a decade of extraordinary growth, CVRD increased production from 11.7 million tons in 1965 to 52.2 million tons in 1975; the 1975 output was 22% over the 42.7 million-ton output of 1974. During the same decade exports increased five times, from 8.9 million tons in 1965 to 47.3 million in 1975.

In the Iron Ore Quadrangle near Itabira, Minas Gerais, CVRD operated five mines—Cauê (the most important), Conceição, Dos Corregos, Periquito, and Picarrão—with ore grades ranging from 51% to 68% iron. The installed mining capacity of this group, was projected to reach 71 million tons in 1976, 84 million tons in 1977, and 104 million tons in the early 1980's. The Conceição mine was being equipped with a new concentrator to be ready in 1977, similar to the one installed at the Caue mine in 1972.

During 1975, CVRD operated two iron ore pellet plants at the port of Tubarão in Espírito Santo State with a total capacity of 5 million tons per year and had formed companies with the Government-owned Companhia Siderúrgica Nacional (CSN) and foreign entities to construct and operate seven new pellet plants with a total capacity of 28 million tons annually giving an overall capacity of 33 million tons by 1978.

Mineraçoes Brasileiras Reunidas S.A. (MBR), owned 51% by the Brazilian mining company Emprendimentos Brasileiros de Mineração S.A. and 49% by St. John d'El Rey Mining Co. Ltd., which was two-thirds owned by the M.A. Hanna Mining Co., was Brazil's newest and second-ranking ore producer. In 1975 MBR shipped 9.9 million tons of ore. During 1975 MBR was undergoing expansion to reach its planned operating capacity of 11.5 million tons per year from its Aguas Claras mine located just south of Belo Horizonte which started up in July 1973. Plans indicate staged expansion of Aguas Claras to 15 million tons in 1977 and 25 million tons in 1982. MBR also operated two other mines in the Iron Ore Quadrangle, Pico de Itabirito and Matuca, which shipped about 2.2 million tons in 1974. Furthermore, the company was studying the possibility of increasing output to 5 million tons per year at each of these two mines.

Another iron ore producer, Cia. de Mineração Ferro e Carvão (FERTECO), owned by a consortium of West German steel companies led by the August Thyssen-Hütte AG, continued its second phase of expansion which began in March 1974. Construction of the new concentrator and pellet plant at the Fabrica Mine near Congonhas do Campo was expected to be completed by late 1976 with an annual production capacity of 2.5 million tons of pellets and 2.5 million tons classified as blast furnace ore and sinter. Expansion of facilities at the Corrego de Feijao mine to 3 million tons per year was in the planning phase. Exports by FERTECO were handled by CVRD at the Tubarão port.

One of the important developments during 1975 was the start of construction of the $400 million project of SAMARCO Mineração S.A., owned 51% by S.A. Mineração da Trindade (SAMITRI) and 49% by the Marcona Corp. The SAMARCO project, scheduled for completion in 1977, included development of the Germano mine southeast of Belo Horizonte in the Iron Ore Quadrangle, a 5-million-ton-per-year pelletizing facility, and a 404-kilometer, 20-inch-diameter slurry pipeline connecting the concentrator to the new port of Ponta Ubu in Espírito Santo, south of Vitória and CVRD's Port Tubarão. The pipeline will be capable of transporting 12 million tons of concentrate slurry per year.

Plans were announced during 1975 for exploitation of the large iron ore deposit in the Serra dos Carajás discovered in 1967, in east-central Pará State about 550 kilometers southwest of Belém. A joint company, Amazonia Mineração S.A. (AMZA), owned 51% by CVRD and 49% by Cia. Meridional de Mineração S.A. (a wholly-owned subsidiary of United States Steel

Corp.), was created in 1970 to develop the extensive Carajãs reserves estimated at 15.7 billion tons of ore grading 60.9% iron. Initial production from the first phase of development was scheduled for 1980 at the 12-million-ton-per-year level; output of 50 million tons was targeted for 1985 requiring an overall investment of $3 billion. The British Steel Corp. along with Spanish and Japanese companies were negotiating for a 20% participation with AMZA in a five-nation project.

Early in 1975, Kawasaki Steel Corporation and four other Japanese firms jointly acquired an interest in Minas de Serra Geral S.A., a Brazilian iron mining firm. The Japanese consortium planned feasibility studies on the $100 million Capanema project to produce 6 million tons per year of iron ore. The output will mainly feed the planned Tubarão steelworks.

Iron and Steel.—Brazil maintained its position, first achieved in 1966, as the largest steel producer in South America, taking advantage of its large high-grade iron ore resources. The steel sector was composed of 7 Government-controlled mills and 31 private producers, some of which operated semiintegrated, low-capacity, miniplants.

In the early part of 1975, the Brazilian steel industry had only modest growth because of continued shortages of imported coking coal and interruptions caused by the installation of new equipment. By mid-1975 the coking coal shortage was alleviated and total steel ingot production continued its historical uptrend. Total production of ingot steel in 1975 of 8.3 million tons represented an 11% increase over that of 1974 and almost triple the output of 3.0 million tons in 1965, a decade before. This output represented 45% of Latin America's total steel production of 18.2 million tons for 1975. But the 1975 output fell short of the 9.5 million tons that had been projected by steel industry planners.

Despite the increase in production, Brazil suffered steel shortages during 1975, especially in the automotive and construction industries. The rapid growth of internal demand required a large increase in pig iron and steel imports which amounted to $1.3 billion in 1975. On the basis of major expansion programs underway in 1975, Brazilian steel planners expected internal demand to be satisfied by domestic mills by 1978; thereafter, Brazil was expected to be a net steel exporter.

By yearend 1975, Brazil had almost completed Phase I of the 10-year National Steel Expansion Plan, and initiated Phase II. This plan announced in 1970 had the goal of more than tripling Brazil's steel output from 5.4 million ingot tons in 1970 to 20 million tons by 1980. Early in 1975 this target was increased to 24 million ingot tons by 1980, but by yearend the Government again revised its expansion targets to 40 million tons of steel products annually by 1985. The National Steel Council—Conselho Nacional de Não-Ferrosos e Siderúrgia (CONSIDER)—was established as the principal planning agency for the steel sector.

Brazil's success in implementing its steel expansion program depended upon obtaining external financing. During 1975 commitments for financing the Phase III expansion program were obtained from France, the United Kingdom, West Germany, Japan, Australia, Finland, and Spain. The aim of the Phase III was to increase raw steel capacity of the three major producers: CSN, Companhia Siderúrgica Paulista (COSIPA), and Usinas Siderúrgicas de Minas Gerais (USIMINAS) from 7.2 million to 11.4 million tons per year by 1980, in order to make Brazil largely independent of imports.

In June CSN received development loans from the World Bank and the Inter-American Development Bank totaling $158 million to help finance Stage III expansion of the CSN steel plant at Volta Redonda west of Rio de Janeiro, and its iron mines at Casa de Pedra. This expansion was expected to raise raw steel production capacity from 2.4 million to 4.4 million tons per year, and increase mine production up to 9.2 million tons of iron ore. The cost of the overall plant and mine expansion was estimated at $2.1 billion. Estimated completion date was 1979.

COSIPA, 82% owned by the Federal Government, was granted $100 million in joint loans from the World Bank and the Inter-American Development Bank in July to help finance the Stage III expansion of its steel mill at Cubatão situated 70 kilometers from São Paulo and 20 kilometers from the port of Santos. The overall project, estimated to require financing of $1.4 billion was designed to increase COSIPA's capacity from 2.3 million to 3.5 million tons of raw steel per year. The estimated completion date was 1980.

In view of the equity participation by Government agencies in a number of steel operations, Siderúrgica Brasileira S.A. (SIDERBRAS) was established in 1973 to consolidate the Government's steel investments in a holding company. SIDERBRAS first acquired the Government's share in CSN, Usina Siderúrgica da Bahia S.A. (USIBA), Cía. Siderúrgica de Mogi das Cruzes (COSIM), and Aços Finos Piratini. By yearend 1975, the Government's shares in USIMINAS, COSIPA, Companhia Aços Especiais Itabira (ACESITA), and Companhia Ferro e Aço de Vitória (COFAVI) were also transferred to SIDERBRAS.

Late in 1975 work began on the feasibility study by Nippon Steel Corporation and SIDERBRAS of the new Itaqui mill to be located near the northern port of São Luis, State of Maranhão. The cost of the 3-million-ton-per-year first stage was estimated at $1.8 billion. The iron and steel works envisioned for Itaqui would be one of the world's largest with an eventual capacity of 16 million tons per year of semifinished and rolled products. Preliminary Stage I plans called for an initial annual capacity of 4 million tons by yearend 1980. The Itaqui complex was to be synchronized with development of the large iron ore deposits at Carajás in the adjacent State of Pará.

Construction was begun on the new iron and steel plant at Tubarão, operated by CVRD. The Tubarão steel project was a joint venture of SIDERBRAS and CVRD with 51% equity and Kawasaki Steel of Japan and Società Finanziaria Siderúrgica S.p.A. (Finsider) of Italy with 24.5% participation each. The estimated cost of the 3-million-ton first stage for the production of slabs was revised to $1.8 billion up from the earlier estimate of $743 million. Stage I was scheduled for completion by 1978 while the eventual capacity of 6 million tons was planned for 1980. In addition to the iron and steel plant approved by CONSIDER in 1974, the new Tubarão steel center was to have at least six new pelletizing plants and two rolling mills.

Brazil and Mexico signed an agreement in mid-1975 to make joint investments to develop their respective steel industries. The agreement provided for the exchange of technical information as well as collaboration in steel production and development. Mexico may also purchase Brazilian iron ore and participate in Brazilian mining operations. Mexico offered to provide information on gasification of bituminous coal for steel industry use.

Ferroalloys.—Early in 1975, the Association of Brazilian Ferro-Alloy Producers (ABRAFE) published its long-range ferroalloy forecast. It projected ferroalloy production, consumption, and trade to 1982, with the main conclusion that Brazil's near self-sufficiency would continue and could develop into a net export position. There was a slight decrease in total ferroalloy production in 1975 but since 1969 the average growth rate was over 22% per year. Expansion was favored by abundant hydroelectric power.

Lead.—Despite modest progress, Brazil continued to depend on imports to satisfy internal demand. About 95% of Brazil's lead ore was produced by two companies: Ciá. Brasileira de Chumbo (COBRAC), a wholly-owned subsidiary of Le Nickel Peñarroya Mokta Group, which operated the Boquira mine in Bahia, and PLUMBUM, also a subsidiary of Peñarroya, which operated the Panela deposit in Paraná.

COBRAC was planning a 13,000-ton expansion of its existing 44,000-ton-per-year smelter at Santo Amaro for 1978. Tonalli S.A. was planning a new 40,000-ton secondary smelter at Jacarei scheduled for production in 1977.

Although lead was included in Brazil's Nonferrous Plan, it was considered less critical than copper or zinc and given less priority because of the smaller impact on Brazil's balance of payments.

Manganese.—Brazil continued as one of the major producers of manganese ore in the world; output was at the level of recent years. Brazil was the prime source of manganese ore imports of the United States, supplying 36% of requirements. Exports of manganese, traditionally Brazil's second largest mineral export, were 1.56 million tons valued at $80.6 million during 1975. The 4% decline in export volume for 1975 was caused by depressed steel demand worldwide.

The major producer and exporter since 1957 of manganese ore and pellets was Industria e Comercio de Minerios S.A. (ICOMI), a joint venture of Companhia

Auxiliar de Empresas de Mineração (CAEMI) of the Antunes Group, and Bethlehem Steel Corp., which operated an open pit mine at the Serra do Navio deposits north of the Amapari River in Amapá Territory.

Late in 1975, ICOMI entered into an agreement with the Brazilian Government to limit exports of high-grade ore and pellets to 1.2 million tons per year, equal to the average yearly exports from the Serra do Navio deposit during most of the past decade. Considering that ICOMI's high-grade, easily transportable ore reserves in Amapá would last only 10 years at the 1975 rate of production, the Government had expressed concern for future supplies of manganese for Brazil's growing steel industry. ICOMI, believed to be the only exporter in 1975, received slightly more than $50 per ton for its ore that year, compared with $33 per ton in 1974 and $24 per ton in 1973.

The Brazilian Government increased its prospecting efforts for manganese ore and was conducting research on utilization of the country's lower grade ores.

DNPM announced the discovery of a large deposit of high-grade manganese ore near the Venezuelan border at Morro de Sete Lagoas in the Uaupes District about 40 kilometers from the Rio Negro, a navigable tributary north of the Amazon River. The size of the deposit was estimated at 25 million to 30 million tons of ore with grades of 47% to 51% manganese. The ore body was also reported to contain 1.0% to 4.0% columbium.

Based on incomplete work by Amazonia Mineração S.A., reserves of about 12 million tons of 40% manganese were identified by mid-1975 at a location 10 kilometers southwest of the original Carajás iron ore discovery site. This discovery had significance because it could be tied into the transportation system to be set up for the Carajás iron ore. Considering this discovery and that in the Uaupes District, total reserves of manganese ore in Brazil were estimated to be 194 million tons. This total does not include a more recent find in Rondônia State, whose grade and extent were being evaluated.

Nickel.—Brazil was primarily a producer of ferronickel in 1975 at a level which did not vary significantly from recent years. There was a sharp 95% increase in imports of unwrought nickel, none of which was produced locally. Empresa de Desenvolimento de Recursos Minerais (CODEMIN) (a subsidiary of Brasimet which in turn is owned by the Hochshild Group and French interests including Le Nickel) operated Mineração Morro de Niquel which produced 97% of Brazil's nickel output from a mine in Minas Gerais.

CODEMIN had a new project in the evaluation stage to produce 12,000 tons per year of electrolytic nickel. An investment of $140 million was estimated. By yearend, CODEMIN was considering cutting back planned capacity to 5,000 tons per year. CODEMIN was negotiating with the Brazilian Ministry of Mines and Energy to provide low-cost energy for its electrolytic project under a formula of sliding rates based upon the international price of nickel.

BAMINCO Mineração e Siderúrgia S.A., a joint venture of the International Nickel Co. of Canada Ltd., a West German consortium led by Metallgesellschaft AG, and minority Brazilian participation, was planning a project at Barro Alto, Goiás, 140 kilometers northwest of Brasília. The BAMINCO project would produce 60,000 tons per year of high-grade ferronickel principally for export. Reserves were estimated at 33 million tons of 1.94% contained nickel.

Tin.—Tin was one of the few metals produced in Brazil, from both domestic and imported concentrates, 150% in excess of domestic demand. Over the last decade, production of cassiterite concentrate (66% Sn) has doubled from 2,459 tons in 1965 but was still not sufficient to meet national requirements. Although tin mineralization is widespread in Brazil with primary deposits in Rondônia, Mato Grosso, Goiás, Amazonas, and Pará, two-thirds of the output was mined from eight alluvial deposits in a band south of Porto Velho in the remote Rondônia tin district east of the Bolivian border, where cassiterite was first discovered in 1952.

Brazil's six domestic tin smelters, located mostly around São Paulo and Rio de Janeiro, imported substantial quantities of cassiterite mostly from Bolivia in order to meet domestic demand for tin as well as overseas demand. Smelter production in 1975 increased 37% over the 1974 output.

Companhia Estanifera do Brasil (CESBRA) operated the largest electrolytic tin refinery at Volta Redonda with a yearly capacity of 6,800 tons.

The Brazilian Government was interested in stimulating prospecting for tin and was considering the potential for enlarging the reserves in Rondônia, Pará and Amazonas. Studies under the RADAM mapping project indicated that occurrences of cassiterite-mineralized granites are larger than originally believed, particularly along the Xingu-Aripuana belt. During 1975 six Brazilian companies were financed through CPRM to prospect for tin.

Titanium.—Early in 1975 CVRD announced plans for a major phosphate fertilizer plant at Tapira, Minas Gerais, a major byproduct of which would be anatase. Reserves were reported to contain 45 million tons of TiO_2. Association with the Japanese Ishihara group in the titanium venture was a possibility. A pigment plant, if constructed, would be operative in 1978 or early in 1979.

Tungsten.—Brazilian production of tungsten concentrate, averaging 70% WO_3, came primarily from the Currais Novos-Lages "tungsten quadrilateral" in the States of Rio Grande do Norte and Paraíba in northeast Brazil. In 1975 there was a minor increase in output over that of 1974. The major producer was Mineração Tomaz Salustino S.A. (MTS), which operated the Brejui mine in Rio Grande do Norte with a 600-ton-capacity gravity concentration plant at the mine site.

Late in 1975 it was reported that MTS would enter a joint venture with Nittetsu Mining Co., Ltd., and Kanematsu Gosho, Ltd., of Japan to set up a new tungsten mine. Construction of a pilot plan to produce 70% to 75% scheelite concentrate from 0.2% tungsten ore was scheduled for May 1976. The two Japanese companies with equity participation of 35% and 14%, respectively, would receive 90 tons of the scheelite annually when the plant operates at full production.

The Brazilian Government participated as an observer at the meeting of International Tungsten Producers Association held in La Paz, Bolivia, in April 1975.

Uranium.—In response to its energy problems, Brazil initiated a nuclear energy program which it hoped would make the country one of the significant producers of nuclear power in the world by the end of the century. Brazil's first 625-megawatt plant was scheduled for testing in 1977 and for completion by 1978. Government planners have set targets of 10,000 megawatts of installed capacity by 1990 and up to 70,000 megawatts by the year 2000.

Although Brazil has abundant thorium, uranium reserves were not so well established. Total measured uranium reserves at yearend 1975 were estimated at 10,000 tons of U_3O_8 located in the Poços de Caldas region of Minas Gerais and the Figueira area of Paraná State. Uranium was extracted in small quantities from a mine at Cercado near Poços de Caldas. A pilot plant to produce U_3O_8 (yellow cake) was inaugurated at Poços de Caldas in December 1974. A 500-ton-per-day mill was expected to produce 240 tons per year of U_3O_8 by yearend 1977.

Exploration for uranium was conducted at some 50 locations throughout the country under the auspices of Empresas Nucleares Brasileiras S.A. (NUCLEBRAS). The prospecting budget for 1975 was $19 million compared with $9 million in 1974.

Zinc.—Output of zinc ore increased by 30% over that of 1974, but Brazil still produced only about 38% of its demand for zinc in 1975. Smelter output increased by only 3%. During 1975 two companies, Companhia Mercantil e Industrial Inga, and Companhia Mineira de Metais of the Votorantim group, operated smelters using concentrates of silicate ores from their mines in Vazante, Minas Gerais. The new or expanded smelter capacity being planned follows:

Company	Location	Type of plant	Date available	Annual capacity (metric tons)	Remarks
Mineira de Metais	Tres Marias	Electrolytic	1978	12,000	Continued expansion of existing plant of 38,000 tons.
Paraibuna de Metais	Juiz de Fora	do	1980	30,000	New plant.
Metamig	Paracatu-Morro, Agudo	do	1980	35,000	Do.

Supplying the smelters with domestic zinc concentrates may be a problem since zinc reserves were considered to be critically short. Zinc received priority second only to copper in the nonferrous group for exploration and development. The Nonferrous Plan projected 315,000 tons per year of zinc production for 1983, requiring investments of $218 million.

The largest known zinc deposits in Brazil were located in the counties of Januaria and Vazante, Minas Gerais. A statement from the Ministry of Mines and Energy early in 1975 specified total known metallic zinc measured reserves of 1.6 million tons which would be sufficient until 1992 at the 1975 rate of consumption.

NONMETALS

Cement.—Brazil's production of cement increased 17% to about 17.4 million tons in 1975. The production of cement continued its steady, strong growth over the last 8 years, making Brazil practically self-sufficient in this commodity.

The new Pedro Leopoldo plant (located in Minas Gerais) of Cimento Nacional de Minas S.A. (CIMINAS) with a capacity of 1.0 million tons per year had its first full year of operation in 1975. This was the largest single cement producing facility in Brazil. Holderbank of Switzerland had equity participation in CIMINAS.

Fertilizer Materials.—The need to import fertilizer materials has been a significant factor in Brazil's foreign trade deficit. Only about 30% of nitrogenous and phosphatic fertilizers consumed in the country were derived from domestic sources in 1975. Brazil produced no potash. Brazil hopes to achieve self-sufficiency in the three basic fertilizer nutrients under the Government's Fertilizer Plan to be completed by 1980. The plan, requiring investments of $1.3 billion, is summarized as follows in thousand tons:

	N	P_2O_5	K_2O	Total
Apparent consumption in 1973	355	790	534	1,679
Annual production in 1973	156	301	--	457
New projects underway	200	480	--	680
Additional projects per fertilizer plan	1,080	1,130	1,000	3,210
Projected production in 1980	1,436	1,911	1,000	4,347
Projected demand in 1980	1,400	1,600	1,000	4,000

Government-controlled companies played a major role in fertilizer production and were expected to increase their role in the future. Practically all nitrogenous fertilizers were produced at three plants operated by Petrobrás Quimíca S.A. (PETROQUISA), a subsidiary of the 75% Government-owned Petróleo Brasileiro S.A. (PETROBRAS); two plants were at Cubatão, São Paulo, and the third at Camaçari, Bahia.

An outcome of CPRM'S priority exploratory efforts, and the major event of 1975 for that entity, was the confirmation of the extent of a major phosphate deposit at Patos de Minas in Minas Gerais. Measured reserves of 256 million tons and indicated reserves of 87 million tons, together, had an average grade of 13% P_2O_5. Additionally there were inferred reserves of 110 million tons. CPRM was constructing a 150,000-ton-per-year prototype beneficiation plant scheduled for completion in March 1976. By 1977 annual production was expected to be increased to 300,000 tons of concentrates. The Patos deposit may have the ability to provide a phosphatic material suitable for use as a direct-application fertilizer.

The single potash project located at Carmopolis, Sergipe, was expected to have 50% participation by PETROQUISA and called for production of 1 million tons of K_2O per year. Although the potassium salt beds were discovered in 1965 while drilling an oil well, exploitation of the deposits had been delayed because of concern by PETROBRAS that the proposed mining methods would interfere with petroleum activities in the area.

Magnesite.—Magnesita S.A. planned to invest about $25 million to increase output of its magnesite mine at Brumado, State of Bahia, and to expand production of refractory materials at its Belo Horizonte plant from 190,000 to 290,000 tons per year.

Quartz.—Brazil, virtually the world's only exporter of electronic-grade quartz crystal and lasca (lower quality quartz crystal chips), took action to establish a domestic manufacturing industry to produce cultured quartz, oscillators, and fused quartz products.

The Government continued its program of export quotas instituted in October 1974 and established for 1975 an export quota of 3,500 tons for lasca. Exports of high-quality quartz crystals continued to be free of controls. For lasca exports, Carteira de Comercio Exterior do Banco do Brasil (CACEX) established a schedule of minimum export prices: $6.00, $3.50, and $1.60 per kilogram f.o.b. for first, second, and third lasca grades, respectively. The minimum export prices made the cost of lasca to foreign purchasers as much as 10 times those of the prior year. An export tax of 40% ad valorem based on the f.o.b. price of lasca exports was required to be paid into a Central Bank fund for furthering domestic research and development of manufactured quartz products.

Sodium Compounds and Chlorine.—Companhia Nacional de Álcalis (CNA) was the only producer of soda ash in Brazil from a plant at Cabo Frio in the State of Rio de Janeiro. Planning continued on the new soda ash project of Alcalis do Rio Grande do Norte S.A. (ALCANORTE) to be located at Macau, Rio Grande do Norte, on the Atlantic coast near existing solar salt operations. ALCANORTE was set up as a joint venture of CNA and Akzo Zout Chemie of the Netherlands. The plant at Macau was to have a capacity of 200,000 tons of soda ash per year. Initial output was expected during 1978.

The Dow Chemical Co. began construction of Phase I of its 150,000 ton-per-year chlor-alkali complex near the new port of Aratú on the Bahia Coast. The plant, estimated to cost $250 million, was to initiate production in mid-1977 and achieve full production capacity during 1978. Phase II of the project was expected to come onstream in 1979. Dow was to supply its own raw material from salt wells on the island of Matarandiba near Aratú.

MINERAL FUELS

Coal.—After years of stagnation, Brazil's coal industry was undergoing a vigorous revival through mechanization, new mines, and increased manpower devoted to the sector. By 1978 metallurgical coal production was projected to reach 2.5 million tons per year. Nonetheless Brazil's ambitious steel expansion program would still rely mainly on higher quality imported coal.

Three States in southern Brazil contained practically all of the known coal reserves. Two of the States, Santa Catarina and Rio Grande do Sul, accounted for almost all of the production, while Paraná was marginally important for some steam coal. Of 22 operating mines in the 3 States, all but 3 were underground. The following table gives a summary of coal reserves:

	Reserves (million tons, measured, indicated, and inferred)	Type
Rio Grande do Sul	3,746	Subbituminous.
Santa Catarina	1,200	Bituminous.
Paraná	36	Subbituminous.
Total	4,982	

The hardships suffered by Brazil's steel industry in 1974 because of shortfalls in imports of metallurgical coal were largely alleviated during 1975. The Brazilian steel industry consumed 3 million tons of coal in 1975 of which 2.2 million tons was imported (chiefly from the United States, which supplied 2 million tons).

In January 1975 the Brazilian and Polish Governments signed a "protocol of intent" to barter iron ore for 14.8 million tons of coking coal over the following 11 years. It was reported that the two Governments discussed a possible Brazilian capital investment in coal production in Poland. In addition, representatives of SIBERBRAS and CVRD visited Canada, Europe, Australia, and the United States for similar discussions.

In November, Island Creek Coal Co., a subsidiary of Occidental Petroleum Corp., agreed to supply USIMINAS 5 million tons of coking coal over the next 5 years. The agreement was valued at $258 million at current prices and involved high- and low-volatile coking coal from Island Creek's Virginia and West Virginia mines.

Natural Gas.—Output of natural gas in 1975 by PETROBRAS, the Government entity with complete control of the natural gas and petroleum sectors except for marketing, was 9.2% higher than that in 1974. The production of liquefied natural gas (LNG) from two plants located in Bahia increased 14%.

Negotiations continued between Brazil and Bolivia concerning the price of natural gas to be supplied by a proposed pipeline in the amount of 240 million cubic feet per day. The natural gas pipeline would run from gasfields north and northwest of Santa Cruz, Bolivia to the border city of Corumba, Brazil, and then on to São Paulo. The Yapacani, Palometas, and Palacios gasfields near Santa Cruz were being held in reserve for the gasline to São Paulo.

Natural gas reserves of Brazil at yearend 1975 were estimated to be 915 billion cubic feet.

Oil Shale.—In October, the President of Brazil announced that PETROBRAS planned to build a commercial plant in Paraná to produce 51,000 barrels per day of petroleum from oil shale. Since mid-1972, PETROBRAS had been operating a $30 million pilot plant at São Mateus do Sul, Paraná, with a production capacity of 1,000 barrels per day of shale oil. Final approval of the project by the Board of Directors of PETROBRAS was expected early in 1976. Production cost was estimated at about $9.00 per barrel. Completion was planned for 1980.

Brazil possesses numerous oil shale deposits, the most important of which is at São Mateus located 140 kilometers southwest of Curitiba, covering an area of 64 square kilometers. The recoverable oil shale reserves in this area were estimated at 600 million barrels.

Petroleum.—Total crude oil production by PETROBRAS declined 3% below that of 1974 and accounted for only 20% of Brazil's requirements. Continued expansion of the economy widened the gap between consumption of 850,000 barrels per day and domestic production of 172,600 barrels per day (145,000 onshore and 26,600 offshore) in 1975.

Brazil's onshore production was concentrated in a cluster of coastal fields in the States of Bahia and Sergipe and was expected to remain relatively constant or decline gradually during the balance of 1970's. Onshore production in the State of Bahia accounted for 64% of the 1975 production, and offshore fields accounted for 16%. The decline in production of crude oil from the onshore fields was partially compensated by a 13% increase in production from the Continental Shelf areas.

The cost of importing petroleum and its derivatives during 1975 was estimated at $3.1 billion on an f.o.b. basis, compared with $2.8 billion in 1974 and $711 million in 1973, and was almost equal to the size of Brazil's large foreign trade deficit. Imports of crude oil amounted to 263 million barrels in 1975, compared with 242 million barrels in 1974, while imports of petroleum products amounted to 4.3 million barrels in 1975, compared with 20 million barrels in 1974.

During the year plans proceeded on the development of a submarine production system for the offshore Garoupa oilfield in the Campos Basin and two nearby structures. The production potential of the Garoupa and surrounding fields was intially estimated at 200,000 barrels per day. Initial production from the temporary subsea system was planned for early 1977 with a rate of 40,000 to 50,000 barrels per day expected by late 1977.

Six new offshore oilfields were discovered in 1975: Pargo, Badejo, and Namorado (all in the Campos Basin), Tainha (Sergipe), Cavala (Alagoas), and Agulha (Potiguar Basin, Rio Grande do Norte). Investment in exploration activities amounted to $370 million. PETROBRAS drilled 88 exploratory wells in 1975, 11 of which produced oil and 3 produced gas.

The most favorable forecasts set Brazil's onshore production at 200,000 barrels per day by 1980. On the basis of expanded exploration and development efforts, it was estimated that output from offshore fields in the Campos Basin and the Ubarana Fields as well as smaller fields off of Sergipe, Bahia, and Espírito Santo could reach 500,000 barrels per day by 1980.

A significant event in October 1975 was the abrupt ending of the 22-year exclusion of private capital in Brazilian exploration and production operations when the Government authorized PETROBRAS to enter into service contracts with foreign companies. The contracts with the private companies were to be a risk-bearing type in which contractors assume the costs of exploration and drilling and can recover their investment only as commercial production is established. The areas defined to be explored by foreign oil companies on a risk contract basis included parts of the Amazon River Delta and portions of the Continental Shelf off the States of Rio Grande do Sul, Maranhão, and São Paulo, along with onshore tracts in the lower and middle Amazon.

Petroleum reserves officially estimated at yearend 1975 were 782 million barrels, a slight increase of 4 million barrels over 1974 yearend figures.

Refining.—PETROBRAS operated nine refineries during 1975 accounting for 98% of the country's refining capacity. Construction continued on two new refineries: One at Araucaria, Paraná, with capacity of 125,800 barrels per day and the other at São José dos Campos, São Paulo, rated at 188,700 barrels per day. Both refineries were scheduled for completion in 1977.

When the new refineries start up and expansion plans for the refineries at Betim Duque de Caxias, Manaus, and Canoas are completed in 1979, Brazil's refinery capacity will increase to over 1,440,000 barrels per day from 986,300 barrels per day in 1975.

Petrochemicals.—In 1975, the Industrial Development Council of Brazil approved the creation of a third petrochemical complex near the Canoas refinery in the State of Rio Grande do Sul. The two complexes already established were at São Paulo and at Camacari in the State of Bahia.

Early in 1975 Dow Quimica S.A., a subsidiary of The Dow Chemical Co., submitted a letter of intent to the Brazilian Government to build a 400,000 ton-per-year ethylene plant at the Camacari complex using naphtha feedstocks and downstream production units for chemicals, plastics, and agricultural products. The estimated $500 million investment would be phased over a 10-year period.

The Mineral Industry of Bulgaria

By Tatiana Karpinsky [1]

Bulgaria's economy continued to grow in 1975. According to official Bulgarian sources, the national income in 1975 increased by 9% in comparison with that of 1974, reaching L14,289 million,[2] and the value of gross industrial production increased 9.9%.[3] Capital investment in the economy totaled approximately L4.6 billion in 1975, an increase of about 1.8% over that of 1974.

In 1975, the ratio between industrial and agricultural production reached 4.3 to 1. The most significant sectors of Bulgaria's economy remained its machine-building and metallurgical industries. In 1975, machine-building production increased 14.8%, ferrous metallurgy output increased 14.3%, and the production of the chemical industry increased 11.9%. In 1975, the machine-building industry accounted for about 24% of the overall industrial output, and the metallurgical industry for about 7%.

The number of industrial workers and employees in state enterprises totaled 1,153,000 in 1974. The number of workers and employees in state mineral and energy enterprises by branch follow:[4]

Branch	Workers and employees (thousands)
Fuel industry	52.6
Ferrous metallurgy (including ore mining)	30.0
Engineering and metalworking industry	320.7
Production of electricity and steam heat and power	18.1

During 1975, Bulgaria produced aluminum, copper, iron and steel, lead and zinc, coal, crude oil, natural gas, fertilizers, cement, and kaolin, among other mineral commodities; the output of most of these commodities was not of world significance.

In 1975, production of hard coal, gas, petroleum, and iron covered only a small part of domestic requirements, and about 11.6 million tons of crude oil and petroleum products, 1.2 billion cubic meters of gas, 6 million tons of hard coal, and 1.7 million tons of iron ore were imported, mostly from the U.S.S.R.[5] In comparison with 1974, imports of oil increased 6.4%, and iron ore imports rose 4.4%.

In 1975, Bulgaria participated in many multilateral investment projects of the East European countries and the U.S.S.R. Bulgaria for the 5 years (1976–80) is to continue to participate in multilateral investment projects for the development of natural gas, petroleum, asbestos, iron ore, nickel, and other mineral deposits in the Soviet Union. In exchange, Bulgaria is to receive, annually, 40,000 tons of asbestos, 2.8 billion cubic meters of gas, 650,000 tons of iron ore and concentrate, and other raw materials.

Government Policies and Programs.—Major growth areas in 1976–80 are expected to be machine building, shipbuilding, chemistry, electronics, and metallurgy. About L775.7 million is budgeted for the renovation of existing mines, and about L1.55

[1] Foreign mineral specialist, International Data and Analysis.

[2] Because of fluctuating exchange rates, a meaningful conversion to U.S. currency is impractical. Therefore, expenditures are reported in Bulgaria lev (L) and are not converted. Exchange rate June 1975: L1=US$1.03=0.71 rubles (U.S.S.R.).

[3] Statisticheski Izvestiya (Statistical News), Sofia. No. 12, 1975.

[4] Statisticheski Godishnik na Narodna Republika Bulgaria 1975 (Statistical Yearbook of the People's Republic of Bulgaria, 1975), Sofia. 1975, p. 146.

[5] Vneshnyaya Torgovlya S.S.S.R. Za 1975 god (U.S.S.R. Foreign Trade for 1975), Moscow. 1975.

million for construction of new production facilities in mining and metallurgy. Among the final targets of the 7th 5-year plan (1976–80) approved by the 11th National Party Congress[6] were an increase in national income of 45%[7] and a 55% increase in gross industrial output, with a 100% growth in the machine-building industry and 80% in the chemical industry. The main emphasis of the plan is on modernization and expansion of existing plant facilities. Labor productivity in industry is expected to increase 55%. Accelerated development is planned for mineral fuel commodities and energy.

Total coal production in 1980 is to increase 33% over the 1975 level, to 37 million tons. The generation of electric energy in 1980 is to reach 38 billion kilowatt-hours and 3,000 megawatts of new generating capacity is to be added in 1976–80. In 1980, about 20% of Bulgaria's electric energy is to come from nuclear powerplants. The metallurgical industry is to be expanded and modernized. Production of steel in 1980 is to each 3.1 million tons, and output of rolled steel products, 3.7 million tons. According to Bulgarian sources, the total value of capital investment is to be about L30.7 billion[8] during 1976–80.

According to Bulgarian sources, during 1971–75 the national income of the country increased 47% (planning 45% to 50%), the gross industrial production increased 56% (planned 55% to 60%), and captial investment reached L20.7 billion (planned L20.0 billion to L21.0 billion).

The sixth 5-year plan (1971–75) was not fulfilled in all sectors according to all reports. Delays in introducing new machinery and technology and in the planned reconstruction and modernization goals led to the special emphasis in the seventh plan (1976–80) on energy and raw materials, machine building, and the chemical industry.

The 1975 plan for total industrial production was reportedly fulfilled. All ministries and departments except the Ministry of Chemical Industry and the Ministry of Supplies and State Reserves fulfilled their annual plans for total industrial production.

Percentage growth of selected indicators follows:

	1974 actual	1975 Planned	1975 Actual	1976 planned
National income	7.5	9.0	9.0	9.0
Industrial production	8.5	8.0	9.9	9.2
Machine building	13.6	--	14.8	14.4
Chemical industry	14.5	--	11.9	13.4
Construction	10.0	--	5.7	8.0
Labor productivity	6.0	8.1	8.7	8.8

PRODUCTION

In 1975, production of coal was 27.8 million tons, an increase of 14.6% over that of 1974. Included in this amount were 27.5 million tons of lignite and 330,000 tons of hard coal.[9] In 1975, over half of the lignite production came from the Maritsa-East coal basin, which is to supply 22 million tons annually by 1980 according to Bulgarian sources. In 1975, about $500 million was invested in the development and modernization of coal mines. Equipment for opencast mines was imported from East Germany and the U.S.S.R.

In 1975, production of iron ore continued to decline (it was 13% below the 1974 level), increasing Bulgaria's dependence upon imported Soviet iron ore. In 1975 the increases in output of iron, steel, and steel products compared with 1974 figures were as follows: Pig iron, 1.7%; crude steel, 3.5%; and rolled steel, 11.4%.[10] The main development targets of Bulgaria's ferrous industry in 1975 were the reconstruction and modernization of the Kremikovtsi iron and steel works. In the future, Bulgaria plans to increase investments at the rate

[6] Rabotnichesko Delo (Labor Review), Sofia. Apr. 7, 1976.
[7] Rabotnichesko Delto (Labor Review), Sofia. Oct. 30, 1976.
[8] Work cited in footnote 7.
[9] Statisticheskiy Yezhegodnik Stran-chlenov Soveta Ekonomicheskoy Vzaimopomoshchi, 1976 (Statistical Yearbook of the COMECON countries, 1976). Moscow, 1976, p. 77.
[10] Pages 79–80 of work cited in footnote 9.

Table 1.—Bulgaria: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 p
METALS			
Cadmium, smelter output e ---metric tons--	200	200	220
Copper:			
Mine output, metal content ---do---	48,000	50,000	55,000
Blister including secondary ---do---	53,000	48,000	60,000
Refined electrolytic including secondary e ---do---	48,000	r 47,000	52,000
Iron and steel:			
Iron ore and concentrate	2,774	2,685	2,337
Pig iron including blast furnace ferroalloys	1,610	1,528	1,565
Crude steel	2,246	2,188	2,265
Semimanufactures	2,098	2,242	2,498
Lead:			
Mine output, metal content e	105	110	110
Smelter including secondary e	107	112	112
Manganese:			
Gross weight	38	34	e 34
Metal content	11	10	e 10
Molybdenum, mine output, metal content e ---metric tons--	140	140	140
Zinc:			
Mine output, metal content e ---do---	80,000	r 80,000	80,000
Smelter including secondary ---do---	80,000	90,000	91,600
NONMETALS			
Asbestos ---do---	600	700	e 700
Cement, hydraulic	4,178	4,297	4,360
Clays, kaolin	185	210	e 210
Fertilizer materials, manufactured:			
Nitrogenous:			
Gross weight	1,412	1,432	1,618
Nitrogen content	519	525	595
Phosphatic:			
Gross weight	408	570	740
Phosphorus pentoxide content	135	188	245
Gypsum and anhydrite:			
Crude	200	246	e 246
Calcined	37	42	e 42
Lime (quicklime)	919	1,312	e 1,300
Pyrite, gross weight e	150	150	150
Salt, all types	74	130	e 130
Sulfur, elemental	180	185	e 185
MINERAL FUELS AND RELATED MATERIALS			
Coal (marketable):			
Anthracite	128	117	120
Bituminous	223	190	210
Lignite and brown	26,459	23,998	27,515
Total	26,810	24,305	27,845
Coke	1,231	1,308	1,364
Natural gas, marketed production ---million cubic feet--	7,844	6,344	e 5,300
Petroleum:			
Crude oil:			
As reported	190	144	122
Converted e ---thousand 42-gallon barrels--	1,387	1,051	891
Refinery products:			
Gasoline ---do---	12,750	13,175	14,195
Kerosine ---do---	1,162	1,240	1,279
Distillate fuel oil ---do---	19,806	21,634	22,007
Residual fuel oil ---do---	30,902	32,301	33,167
Lubricants ---do---	490	490	560
Asphalt including natural ---do---	1,491	1,666	2,121
Total ---do---	66,601	70,506	73,329

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.

of 2.5% annually to produce higher quality steels and to build two nonintegrated steel plants.

In 1975 production of crude petroleum continued to decline; crude oil production was 122,000 tons (about 15.3% below the 1974 level).[11] Crude-oil-processing capacity was 15 million tons in 1975, but only 12.5 million tons was processed.

[11] Page 78 of work cited in footnote 9.

In 1975, the second reactor of Bulgaria's first nuclear powerplant, Kozloduy, went into operation; total capacity of this plant reached 880 megawatts. This nuclear powerplant produced 2.5 billion kilowatt-hours in 1975. In 1975, total production of electrical energy reached 25.2 billion kilowatt-hours, an increase of 10.6% compared with the 1974 level.[12]

Among the more significant nonmetallic minerals, Bulgaria produced about 25,000 tons of fluorspar and 4.4 million tons of cement. In 1975, the cement output increased 1.4% compared with that of 1974.[13]

TRADE

In 1975, Bulgaria maintained trade relations with 110 countries. Bulgaria's foreign trade turnover (imports plus exports) in 1975 amounted to L9,777 million, an increase of L2,310 million, or 31.0%, over that of 1974. Total exports were valued at L4,540 million, an increase of L1,269 million, or 38.8%, and the value of imports rose to L5,236 million, an increase of L1,040 million, or 24.8%. The trade deficit decreased from L925 million in 1974 to L696 million in 1975, or 24.8%.[14]

In 1975, Bulgaria's foreign trade turnover with CMEA[15] countries was approximately 80% of its total turnover; trade with developed market economy countries amounted to about 13%, and trade with developing market economy countries to about 7%. In 1975, Bulgaria's largest trading partner among CMEA countries was the U.S.S.R. East Germany was the second largest trading partner, followed by Poland, Czechoslovakia, Romania, Hungary, and others.[16]

The value of Bulgaria's total trade with the U.S.S.R. (import and export) in 1975, amounted to 3,991 million rubles, an increase of 1,086 million rubles, or 37.4%, over that of 1974.[17] Trade with the Soviet Union accounted for about 57% of Bulgaria's total foreign trade in 1975.

In 1975, exports of machinery and equipment contributed about 40% of the value of Bulgaria's total exports to the U.S.S.R.; steel and steel products 0.5%; chemical products 2.5%; and products of remaining industries and agriculture about 57%. Imports of machinery and equipment accounted for 32% of the value of Bulgaria's total imports from the U.S.S.R.; petroleum and petroleum products 19%; gas 2%; coal (anthracite and bituminous) 7%; electrical energy 3%; iron ore 1.5%; steel and steel products 12%; pig iron 1%; rolled nonferrous metals 2%; chemical products 2.5%; and products of remaining industries 18%.

In 1975, increases in commodity imports, compared with 1974, were as follows: Crude oil 6.4%, pig iron 4.4%, superphosphate 3.8%, potash 8.1%, and cement 27.7%.

Between 1973 and 1975 the value of crude oil trade between the U.S. and Bulgaria increased eightfold to approximately $50 million. Areas in which Bulgaria is most keenly interested are U.S. equipment, technology, agriculture and food processing, chemicals, electronics, metallurgy, and construction.

By 1980, the value of total trade with foreign countries is planned to increase 60% over that of 1975. A major objective during the 1976–80 plan is to step up exports in order to achieve a better foreign trade balance.

[12] V'Glishta (Coal), Sofia. July 1976, pp. 5–7.
[13] Page 103 of work cited in footnote 9.
[14] United Nations Monthly Bulletin of Statistics. V. 30, No. 9, September 1976.
[15] CMEA—Council for Mutual Economic Assistance—comprises Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.
[16] Rabotnichesko Delo (Labor Review), Sofia. Oct. 9, 1976, p. 5.
[17] Work cited in footnote 5.

Table 2.—Bulgaria: Exports of mineral commodities [1]

(Metric tons unless otherwise spec ied)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal including alloys, unwrought and semimanufactures	6,674	5,614	Yugoslavia 2,934; Japan 1,865; West Germany 755.
Cadmium metal, all forms	15	12	All to Czechoslovakia.
Copper:			
Copper sulfate [2]	12,199	3,160	Switzerland 336.
Metal including alloys:			
Scrap	NA	173	All to West Germany.
Unwrought and semimanufactures	4,432	2,648	Yugoslavia 1,742; Italy 619.
Iron and steel:			
Scrap	45,911	93,694	Italy 54,857; Yugoslavia 38,837.
Pig iron	8,881	11,335	Poland 8,878; Switzerland 1,422.
Ferroalloys	12,777	1,422	All to Switzerland.
Steel, primary forms ____thousand tons	175	160	Italy 59; Spain 40; Yugoslavia 28.
Semimanufactures: [3]			
Bars, rods, sections ____do	r 141	139	Romania 45; Yugoslavia 26.
Plates and sheets ____do	531	423	West Germany 66; Italy 49.
Hoop and strip ____do	4	3	Italy 2.
Wire ____do	7	6	Iran 2; Greece 2.
Pipes and tubes ____do	95	99	Poland 21; West Germany 18; U.S.S.R. 16.
Total ____do	r 778	670	
Lead:			
Oxides	887	2,038	Italy 692; Japan 450; France 396.
Metal including alloys, all forms	15,496	20,508	Yugoslavia 10,866; Italy 7,635.
Nickel including alloys:			
Scrap	NA	NA	
Unwrought and semimanufactures	210	173	Netherlands 148; West Germany 25.
Magnesium	75	80	United Kingdom 50; West Germany 30.
Silver:			
Waste and sweepings __value, thousands	--	$79	NA.
Metal including alloys ____do	$2,136	$6,196	United Kingdom $2,904; West Germany $1,841; Italy $787.
Zinc:			
Scrap	--	45	All to Spain.
Unwrought and semimanufactures	28,776	22,639	Italy 5,860; France 5,213; Yugoslavia 3,967.
Other:			
Ash and residue containing nonferrous metals	NA	161	Belgium-Luxembourg 130; Italy 31.
Metals including alloys, all forms	4,932	222	West Germany 111; Belgium-Luxembourg 98.
NONMETALS			
Asbestos	1,990	--	
Barite	261,990	239,009	All to U.S.S.R.
Cement [2] ____thousand tons	120	143	Yugoslavia 97; Libya 10.
Clays and clay products:			
Crude clay, kaolin	10,783	13,464	All to Italy.
Products, nonrefractory	43,187	53,595	All to Yugoslavia.
Diamond, industrial ____value, thousands	$61	$38	All to Belgium-Luxembourg.
Fertilizer materials:			
Nitrogenous [2]	r 405,133	556,214	India 63,453; Egypt 27,746.
Ammonia	4,001	1,873	Yugoslavia 1,016; Greece 857.
Sodium and potassium compounds:			
Soda ash [2]	23,606	336,971	U.S.S.R. 243,956; Hungary 17,211.
Stone, dimension	2,607	1,627	All to West Germany.
Sulfur, sulfuric acid [2]	37,316	31,366	Romania 21,189; Yugoslavia 9,394.
Talc	9,539	24,139	All to U.S.S.R.
Other, crude, n.e.s	12,971	5,143	Austria 3,674; West Germany 1,469.
MINERAL FUELS AND RELATED MATERIALS			
Coke, metallurgical	82,600	NA	
Petroleum:			
Crude ____thousand 42-gallon barrels	364	NA	
Refinery products:			
Gasoline ____do	110	--	
Distillate fuel oil [4] ____do	28 (with Residual fuel oil)	4	All to Yugoslavia.
Residual fuel oil ____do		7	All to Italy.
Lubricants ____do	160	129	United Kingdom 58.

See footnotes at end of table.

Table 2.—Bulgaria: Exports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other:			
Liquefied petroleum gas thousand 42-gallon barrels	78	173	Yugoslavia 93; Greece 76.
Mineral jelly and wax do	8	9	Austria 3; Spain 2; Yugoslavia 2.
Unspecified do	83	39	All to Spain.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	11,410	9,702	Italy 4,604; Greece 4,596.

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. 1973 and 1974 editions. New York, 1974 and 1975.

4 Data from United Nations. World Energy Supplies, 1950–74 (Series J, No. 19). New York, 1976.

Table 3.—Bulgaria: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite	67	45	All from Hungary.
Alumina	2,147	1,888	Italy 1,667.
Metal including alloys, all forms	36,153	34,352	U.S.S.R. 22,639; Yugoslavia 4,906; West Germany 4,432.
Antimony	700	NA	
Copper:			
Ore and concentrate	79	9,764	All from Sweden.
Copper sulfate	NA	8,132	All from U.S.S.R.
Metal including alloys, all forms	5,517	6,086	U.S.S.R. 2,262; Austria 1,268; West Germany 1,220.
Iron and steel:			
Iron ore[2] thousand tons	1,886	2,396	U.S.S.R. 2,003.
Metal:			
Scrap do	31	--	
Pig iron[2] do	268	340	U.S.S.R. 337.
Ferroalloys do	14	15	Mainly from U.S.S.R.
Steel, primary forms do	7	2	United Kingdom 1.
Semimanufactures:[3]			
Bars, rods, sections do	506	480	U.S.S.R. 394; Poland 34.
Plates and sheets do	368	308	U.S.S.R. 169; West Germany 42; Belgium-Luxembourg 28.
Hoop and strip do	24	20	West Germany 10; Poland 3; Japan 2.
Rails and accessories do	61	54	U.S.S.R. 43; Yugoslavia 6.
Wire do	20	20	U.S.S.R. 7; West Germany 6; Austria 4.
Pipes, tubes, fittings do	141	109	West Germany 43; Italy 18; Poland 12.
Castings and forgings do	1	(4)	Mainly from West Germany.
Total do	1,121	991	
Lead:			
Metal including alloys, all forms	NA	(4)	NA.
Oxides	--	659	All from Austria.
Manganese:			
Ore and concentrate thousand tons	108	NA	
Oxide	120	210	All from Japan.
Mercury 76-pound flasks	609	290	All from Yugoslavia.
Nickel including alloys, all forms	359	702	Mainly from West Germany.
Platinum-group metals value, thousands	$270	$566	West Germany $371; Switzerland $103; Belgium-Luxembourg $89.
Silver metal including alloys, all forms do	NA	$147	West Germany $84; Switzerland $37.

See footnotes at end of table.

Table 3.—Bulgaria: Imports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Tin:			
Oxides	16	15	All from West Germany.
Metal including alloys, all forms	485	95	United Kingdom 55; Spain 40.
Titanium oxides	1,366	2,011	West Germany 551; Italy 532; Spain 500.
Tungsten: Metal	6	4	Mainly from United Kingdom.
Zinc ore and concentrate	45,624	568	All from Greece.
Other metal including alloys:			
Metalloids	531	691	Mainly from Yugoslavia.
Unwrought and semimanufactures	r 14,487	16,531	Mainly from U.S.S.R.
NONMETALS			
Abrasives:			
Dust of semiprecious stones value, thousands	$138	$153	All from Belgium-Luxembourg.
Grinding and polishing wheels and stones	200	566	Austria 412; Italy 86.
Asbestos	30,592	32,564	All from U.S.S.R.
Cement thousand tons	r 139	137	Do.
Clays and clay products:			
Crude	1,325	1,152	United Kingdom 1,003; West Germany 149.
Products, refractory and nonrefractory	r 34,583	29,242	U.S.S.R. 25,073; Yugoslavia 2,138.
Diamond, industrial value, thousands	$301	$222	Mainly from Belgium-Luxembourg.
Feldspar and fluorspar	632	1,857	Yugoslavia 1,634; West Germany 223.
Fertilizer materials:			
Crude:			
Phosphatic (apatite concentrate)	r 427,900	426,213	All from U.S.S.R.
Potassic (salts)	75,800	86,211	Do.
Manufactured:			
Phosphatic	344,789	185,298	Do.
Mixed	18,319	510	All from United Kingdom.
Magnesite	--	365	All from Austria.
Pigments, mineral, iron oxide	NA	(4)	NA.
Salt thousand tons	164	NA	
Sodium and potassium compounds:			
Caustic soda	560	14,246	Italy 5,289; West Germany 4,149; Japan 3,558.
Sodium sulfate	18,266	NA	
Stone, sand and gravel	NA	110	All from Yugoslavia.
Sulfur	7,649	8,783	U.S.S.R. 7,991.
Other:			
Crude nonmetals	177	104	All from United Kingdom.
Oxides and hydroxides of barium, strontium, magnesium	91	252	France 205; West Germany 47.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [2]	16,964	22,632	U.S.S.R. 20,045.
Coal, all grades thousand tons	5,762	6,183	U.S.S.R. 5,943; Poland 240.
Coke [2] do	375	357	U.S.S.R. 299; Poland 25.
Gas, natural million cubic feet	--	10,839	All from U.S.S.R.
Petroleum:			
Crude thousand 42-gallon barrels	70,836	78,042	U.S.S.R. 66,216.
Refinery products:			
Gasoline do	9	NA	
Kerosine do	NA	1	All from Yugoslavia.
Distillate fuel oil do	225	[5] 9	Greece 5; Yugoslavia 3.
Residual fuel oil do	981	[5] 23	Greece 17; Yugoslavia 5.
Lubricants do	50	36	Netherlands 15; Belgium-Luxembourg 7; United Kingdom 4.
Other do	5	10	United Kingdom 5; United States 2.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	18,524	13,254	U.S.S.R. 12,944.

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, 1975.

[4] Less than ½ unit.

[5] Imports from Romania are not available.

COMMODITY REVIEW

METALS

Aluminum.—Construction of the first aluminum-processing plant, with an annual capacity of 48,000 tons of rolled semifinished products, at Shumen City continued in 1975.[18] Planned construction goals for 1975 had not been reached. It was reported that the plant may be completed in 1978. Aluminum ingots are to be supplied by the U.S.S.R. In 1975, Bulgaria imported 23,500 tons of aluminum from the U.S.S.R., an increase of 3.8% over that of 1974.

Copper.—In 1975, copper ore output amounted to 12.2 million tons, an increase of 20.8% over that of 1974. In 1976, copper ore production is planned to reach 12.3 million tons.

Cooper ore deposits are located in scattered regions of the country: In the Chelopech and Elatsite regions (the Central Balkans), in Panagurishte and Medet (the southern part of Sredna Gora), and in the Burgas area near the Black Sea Coast.

In 1975, about 70% of the national copper ore production came from the large Medet open pit mine with an annual capacity of 8 million tons; the rest came from the Chelopech underground mine (production 100,000 tons of ore per year), Burgas, Panagurishte, and other mines.

Medet ore contains about 0.36% copper and 0.008% molybdenum. The chalcopyrite copper ores at the Burgas mine were used in metallurgy and in the chemical industry as a source of sulfuric acid. The chemical composition of copper ore from Burgas mines in percent follows: Copper, 1.15; molybdenum, 0.03; iron, 12.5; sulfur, 3.5; cobalt, 0.01; zinc and lead, traces; and SiO_2, 45.[19]

Planned production of copper concentrate (20% copper content) for 1980 was about 366,000 tons. In 1975, production of electrolytic copper amounted to 52,000 tons. Consumption of copper in Bulgaria is entirely satisfied by domestic production. In 1976–80, heavy investment is planned to develop the mining industry, including copper mining. One of the major projects in the seventh 5-year plan is the development of a new open pit mine at Elatsite, about 50 miles northeast of Sofia, with a capacity of 10 million tons of ore per year (0.45% copper content). Another main project is to increase the capacity of the copper refinery at Pirdop by 30%. Future exploration is planned for new copper reserves in the western Sredna Gora area, the Chelopech Field, and the Burgas-Strandzha region.

Iron and Steel.—Production of iron ore in Bulgaria totaled 2,337,000 tons in 1975, a decrease of 13.0% compared with the 1974 level.[20] Production of iron ore fell owing to the reduction in output at the Kremikovtsi iron ore open pit.

In 1975, requirements of the iron and steel industry were met by importing iron ore mainly from the Soviet Union and partly from India and Algeria. Total imports of the iron ore and concentrates amounted to 1,918,000 tons[21] in 1975. To obtain a new source of iron ore, Bulgarian builders started to work in the Soviet Union on a new project in the area of the Kursk Magnetic Anomaly under an agreement which provided that a certain percentage of the iron concentrate would go to Bulgaria in payment for the work.

Principal Bulgarian iron ore deposits are located in Kremikovtsi, north of Sofia, and contain relatively low-grade ores. ,

The seventh 5-year plan called for future prospecting for iron ores in the Burgas-Strandzha region, Martinovo, and the Pirin Mountains.[22]

In 1975, production of pig iron totaled 1,509,000 tons,[23] an increase of 1.7% over that of 1974. It is anticipated that the output of pig iron in 1976 will reach 1.6 million tons. Imports of pig iron reached 330,000 tons in 1975, about the same as in 1974.

In 1975, Bulgaria produced 2,265,000 tons of crude steel, an increase of 3.5% over that of 1974. It is anticipated that the output of crude steel in 1976 will reach 2.6 million tons.

The output of pig iron, crude steel, and rolled steel products during the last years

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[18] Trud (Labor), Sofia. July 31, 1976, p. 2.

[19] Kovachev, K. Obogatyavanya na rudite v B'lgariya (Mineral Processing in Bulgaria). Technology, Sofia, 1964, p. 15.

[20] Page 78 of work cited in footnote 9.

[21] Page 355 of work cited in footnote 9.

[22] Spisanie na B'lgarskagoto Geologichesko Druzhestvo (Review of the Bulgarian Geological Society), Sofia. V. 37, No. 1, 1976, pp. 9–16.

[23] Page 79 of work cited in footnote 9.

of three 5-year periods follow in thousand tons:

	1965	1970	1975
Pig iron	712	1,203	1,509
Steel	586	1,789	2,265
Rolled steel products	430	1,420	2,498

From 1970 to 1975 the output of pig iron increased 25.4%, steel 26.6%, and rolled products 75.9%.

In 1975, rolled steel production totaled 2,498,000 tons, an increase of 11.4% over that of 1974. Production of welded pipe reached 186,000 tons, an increase of 3.9%. Production of rolled products in 1976 is expected to be 2.8 million tons, and that of pipe, 189,000 tons.

Rolled steel exports in 1975 totaled 829,000 tons; imports amounted to 918,000 tons. Apparent steel consumption in 1975 amounted to 3,223,000 tons, or 7% more than in 1974.

There were two large metallurgical complexes in 1975: The Lenin metallurgical complex at Pernik, commissioned in November 1953; and the Kremikovtsi complex, which started production in 1963. The Lenin metallurgical complex was developed during 1957–61, when an agglomerating plant, blast furnace, steel mill, and rolling mill were commissioned. In 1964 and in 1967, the Lenin metallurgical works was modified and enlarged. As a result, production of the Lenin metallurgical complex reached about 650,000 tons of steel products in 1975. The Kremikovtsi complex is a much larger metallurgical center. It is fully integrated enterprise with a varied line of steel products; hot-rolled products, cold-rolled products, seamless pipe, welded pipe, plastic-coated metal plates, and ferroalloys.

In 1975, the Kremikovtsi metallurgical complex produced 1,257,000 tons of pig iron, 1,658,000 tons of crude steel, and 1,804,000 tons of rolled products. From 1970 to 1975, the production of the Kremikovtsi complex increased 2.2 times.

Bulgaria's main target in the ferrous industry in 1975 was to continue construction and expansion of the Kremikovtsi works. A 1,200-millimeter cold-rolling mill was commissioned in November 1974. In 1975, a 100-ton electric arc furnace and a line for plastic coating of sheets were brought into operation. The Kremikovtsi steelworks is the principal supplier of many national industries and also an exporter of steel products. Expansion of Bulgaria's economy calls for a further enlargement of the steel industry.

The seventh 5-year plan (1976–80) calls for further development and reconstruction of the Lenin and Kremikovtsi metallurgical complexes.[24] In ferrous metallurgy, the Bulgarians are interested in U.S. technology in order to improve existing facilities and to begin a third new metallurgical complex near Varna.

Lead and Zinc.—In 1975, Bulgaria produced about 110,000 tons of lead and 80,000 tons of zinc. Bulgaria produced enough lead and zinc to cover domestic consumption and a modest export demand. Total consumption of lead was approximately 84,000 tons, and consumption of zinc was 40,000 tons in 1975.

In 1975, Bulgaria exported zinc to the United Kingdom, Italy, France, and Czechoslovakia. Bulgaria has several mining enterprises for lead-zinc production: Gorubso, Ustreme Madjorovo, Osogovo, Dimitrov, and a few others. The main lead-zinc producer is the Gorubso Mining Enterprise, which accounts for about 70% of the total Bulgarian production. The Gorubso Enterprise has about 40 mines and 7 beneficiation plants. In 1975, 1 ton of lead concentrate (70% lead) was obtained from about 35 tons of ore and 1 ton of zinc concentrate (52% zinc) from about 37 tons of ore.[25] The lead and zinc concentrates were processed mainly at the Plovdiv and Kardjali smelters, which increased output about 4% in 1975.

Considering the further development of lead-zinc production in Bulgaria, prospecting is to be concentrated mainly at greater depths in the vicinity of operating mines in the central and eastern Rhodopes, Osogovo, Sakar Mountains, and Vratsa region.

Bulgaria has signed an agreement with the U.S.S.R. for joint development of Bulgarian nonferrous metallurgy in 1976–80 and beyond. The U.S.S.R. is to aid Bulgaria in the construction and modernization of 14 nonferrous industry projects.

Uranium.—Information on Bulgaria's uranium mining and reserves in 1975 was practically nonexistent because such data

[24] Politicheska Agitatsiya (Political Agitation), Sofia. No. 15, 1976, pp. 30–34.
[25] Work cited in footnote 19.

are classified. Bulgarian production of uranium is estimated at 1,000 tons of U_3O_8 per year. All of the production is exported to the U.S.S.R. The uranium ore is mined near Sofia (Stara Planina) and in the mountain region near the Yugoslav and Greek borders.[26]

NONMETALS

Cement.—In 1975, cement production totaled 4.4 million tons, a 1.5% increase over that of 1974 and a 19% increase over that of 1970. Imports of Soviet cement amounted to 175,000 tons in 1975, an increase of 27.7% over that of 1974. The construction of two additional production lines at the Devnya cement works was in progress during 1975; one production line is to be put into operation in 1976, and the other in 1977. Total production of cement is expected to reach 2 million tons per year by 1977. The 5-year plan (1976–80) also provides for the expansion of Beli Izvoi and Temelkovo cement works.

Fertilizer Materials.—Bulgaria produced about 595,000 tons of nitrogen fertilizer (nutrient content) in 1975, an increase of 13.3% over that of 1974. Output of nitrogen fertilizer in 1976 was planned to increase 5.9%. In 1975, the output of nitrogen fertilizer exceeded domestic demand and provided some 215,000 tons for export. Urea exports amounted to 148,500 tons, or about 69% of all nitrogen fertilizer exports of the country. In 1975, Bulgarian exports of urea were to Egypt (70,000 tons), India (60,000 tons), and the People's Republic of China (about 20,000 tons). Bulgaria's exports of nitrogen fertilizers are dependent on urea and have been enhanced by a rapid expansion in urea productive capacity. The main source of nitrogen exports has been the 366,000-ton-per-year nitrogen-ammonia and/or urea complex at Vratsa, completed in 1968. The other nitrogen-urea plants are located at Dimitrovgrad and Stara Zagora.[27]

In 1975, phosphatic fertilizer production reached about 245,500 tons, an increase of 30.6%[28] over that of 1974. In 1976, production of phosphate fertilizer is expected to increase 38.3% over that of 1975. Estimated imports of phosphatic fertilizers amounted to about 38,800 tons and imports of potassium fertilizers to about 50,800 tons (nutrient content) in 1975.[29]

The new Povelianovo compound fertilizer plant at Varna started production in September 1975 with total capacity of 914,000 tons of fertilizers per year. A new nitrogen fertilizer plant was planned at Varna with a capacity of 1,800 tons per day.

Bulgaria is to produce about 716,000 tons of nitrogen and 450,000 tons of phosphorus fertilizers per year by yearend 1980 and planned to be self-sufficient in fertilizer production by that time. During 1975–80, the chemical works at Stara Zagora and Dmitrovgrad are to be adapted to use natural gas as basic raw material; the Dimitrovgrad works will produce triple superphosphate. The fertilizer works at Devnya will also be developed.

MINERAL FUELS

Coal, mostly lignite, has been the major source of primary energy in Bulgaria. Total production of primary energy derived from fossil fuels, and hydroelectric and nuclear generation rose from 13.1 million tons in standard coal equivalent in 1974 to 15.2 million tons in 1975. In 1975, the share of coal in total primary energy production was about 92.7%; other components were: Crude oil, 1.3%; natural gas, 2%; hydroelectric power, 2%; and nuclear power, 2%.

The share of nuclear energy in total primary energy output increased from 0.8% in 1974 to 2% in 1975, but the share of coal decreased from 93.9% in 1974 to 92.7% in 1975.

Total consumption of all types of primary energy in Bulgaria increased from 36.0 million tons in standard coal equivalent in 1974 to 40.8 million tons in 1975. The total primary energy balance for 1974 and 1975 is given in table 4.

Coal.—In 1975, Bulgaria produced 27.8 million tons of coal, including 330,000 tons of hard coal, an increase of 14.6% over that of 1974.[30] Coal production is expected to reach about 37 million tons in 1980 and about 50 million tons in 1990. In 1975, about 6.3 million tons of hard coal was imported, an increase of 4.9% over that of 1974; 5.9 million tons came from the U.S.S.R. and 0.4 million tons from Poland. Imports of coke amounted to 357,000 tons in 1975. In 1975, the Maritsa-East lignite

[26] Gluckauf Essen. No. 6, 1976, p. 112.
[27] Nitrogen. No. 101, May–June 1976, pp. 18–21.
[28] Robotnichesko Delo, Sofia. Jan. 31, 1976. p. 3.
[29] Page 355 of work cited in footnote 9.
[30] Work cited in footnote 9.

Table 4.—Bulgaria: Total primary energy balance for 1974 and 1975

(Million tons of standard coal equivalent) [1]

	Total primary energy	Coal	Crude oil	Natural gas	Hydroelectric energy	Nuclear energy	Turnover of electric energy
1974:							
Production	13.1	12.3	0.2	0.2	0.3	0.1	--
Exports	.1	.1	--	--	--	--	--
Imports	23.0	6.2	16.0	.4	--	--	0.4
Apparent consumption	36.0	18.4	16.2	.6	.3	.1	.4
1975:							
Production	15.2	14.1	.2	.3	.3	.3	--
Exports	--	--	--	--	--	--	--
Imports	25.6	6.6	17.0	1.6	--	--	.4
Apparent consumption	40.8	20.7	17.2	1.9	.3	.3	.4

[1] 1 ton standard coal equivalent (SCE) = 7,000,000 kilocalories. Conversion factors used follow: 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 energy, 0.125 (per 1,000 kilowatt-hours).

Sources: United Nations. Annual Bulletin of Coal Statistics for Europe. New York, v. 10, 1976, pp. 10, 44, 64, 67, 90.

V'Glishta (Coal), Sofia. July 1976, pp. 5–7.

basin supplied about 57% of the total coal production of the country, and in 1990 production of this basin is expected to be 60% of total coal production. Several new coal mines were brought into operation in 1975 including the Troyanovo 3 lignite open pit (3 million tons per year), the underground Bobov Dol hard coal mine (500,000 tons per year), and the underground Meritcherli 3 brown coal mine (300,000 tons per year). During the last 5 years (1971–75), opencast mining has been expanded considerably. Almost all opencast mines were mechanized and modernized with machinery imported from East Germany and the U.S.S.R.

Coal reserves at Marista-East are estimated at 3,000 million tons (two-thirds of all coal reserves),[31] and those at Bobov Dol at 200 million tons.[32] In the seventh 5-year plan (1976–80) coal output is planned to increase 32%. The plan foresees the develment of the Maritsa-East complex, which is to produce 22 million tons of coal annually by 1980 and is to include the modernization of Troyanovo 1 mine and development of the new Troyanovo 2 mine.

The production of Troyanovo 3 open pit mine is planned to reach 8 million tons per year in 1980. The plan also calls for expansion of the Bobov Dol mine to meet requirements of the region's electric power stations. The production of Meritcherli 3 is to be 2 million tons in 1980.[33]

Natural Gas.—In 1975, extraction of gas was estimated at about 227 million cubic meters. Imports of natural gas from the U.S.S.R. totaled 1,200 million cubic meters in 1975. In 1975, Soviet gas was used in power stations and petrochemical plants.

Bulgaria started receiving gas by the U.S.S.R.-Bulgaria pipeline in 1974, but the construction of the Orenburg pipeline is expected to result in an additional gas supply of 2,800 million cubic meters per year from the U.S.S.R., starting in the fourth quarter of 1978.

The southern branch of the U.S.S.R.-Bulgaria main pipeline is to be built in 1976–80. This stretch will be 267 kilometers long and will supply the chemical works in southern Bulgaria.

Petroleum.—Production of crude oil in Bulgaria was relatively insignificant. In 1975, the output amounted to 122,000 tons,[34] a decrease of 15.3% compared with that of 1974. In 1975, Bulgaria imported 11.6 million tons of crude oil and petroleum products from the U.S.S.R., and some additional crude oil was imported from Iran and Libya. In 1975, imports of crude oil increased 6.4% over those of 1974. According to Bulgarian sources, about 14 mil-

[31] IXth World Mining Congress, Federal Republic of Germany, May 1976, III–23, p. 2.

[32] Vilag Gasdasag Melleclet (Budapest newspaper). Aug. 19, 1976.

[33] V'Glishta (Coal), Sofia. June 1976, p. 3.

[34] Page 78 of work cited in footnote 9.

lion tons of crude oil will be imported in 1976.

Bulgaria had a crude oil processing capacity of 15 million tons per year, but only 12.5 million tons of crude oil was processed in 1975 (8 million tons at Burgas and 4.5 million tons at Pleven). Crude oil processing capacity is planned to increase to 20 million tons in 1980.

In 1975, expansion of the oil processing complex near Pleven was underway, and a new refinery with a total capacity of 2.5 million tons per year was planned at Shabla. New installations and equipment are to be put in operation in the Burgas petrochemical works during 1976–80.

Production of Bulgarian chemicals and petrochemicals is planned to increase 80% in 1976–80, and the planned investment is to be $700 million. About 35% will be allocated to petrochemicals, which will account for 40% of total chemical output in 1980.

The most productive oilfields in Bulgaria are at Dolni Dubnic, northwest of Pleven, but it was reported that by 1975 over 70% of Dolni Dubnik's reserves were depleted. A new oilfield was discovered at Dolni Lukovit (Pleven region), and development of this field began in 1975. The search for new oilfields will be continued in 1976–80. Offshore drilling in the Black Sea near Tyulenevo is to continue. Bulgarian oil shale reserves, which amount to several billion tons, are valuable potential energy raw materials. In 1976, industrial experiments are to be carried out in the U.S.S.R. on the heat treating of Bulgarian oil shales.

Electric Energy.—In 1975, Bulgaria produced 25.2 billion kilowatt-hours of electric energy, an increase of 10.6% over that of 1974. The installed capacity of electric powerplants was 6,912 megawatts in 1975, up from 4,078 megawatts in 1970. Installed capacity is planned to reach about 10,000 megawatts in 1980, and electrical energy output is to reach 38 billion kilowatt-hours.

In 1975, the nuclear powerplant in Kozloduy produced about 2.5 billion kilowatt-hours of electric energy. In 1980, 20% of Bulgaria's generated energy is to come from nuclear plants. The Soviet Union is to supply nuclear generators and fuel elements.

In 1975, Bulgaria's electric powerplants were fueled mainly by coal; about 41% of the total electric energy generated came from domestic coal, about 23% came from imported coal, 10% was derived from hydroelectric power stations, 10% came from nuclear powerplants, and 16% was derived from oil. In 1975, Bulgaria imported 4 billion kilowatt-hours of electrical energy.[35] The plans for 1976–90 call for the construction of three nuclear power stations, four thermal powerplants in Maritsa coal basin with total installed capacity of 2,260 megawatts, two hydroelectric power stations on each side of the Danube with projected total electric energy of 2 billion kilowatt-hours per year, and a few smaller projects.[36]

[35] Work cited in footnote 16.
[36] Energetika, Sofia. No. 4–5, 1975, pp. 71–73.

The Mineral Industry of Burma

By Gordon L. Kinney [1]

Burma's 1975 mineral production remained essentially unchanged from that of 1974. Lack of modern equipment, prohibition of foreign investment, student unrest, and insurgent activity combined to prevent any really significant improvements in the mining sector. The high rate of inflation continued, with 1975 prices more than 300% above the 1969–70 level. The inflation was fueled by an expanded money supply, which was used to finance successive years of large budget deficits.[2]

The Ministry of Mines was reorganized in April 1975. The new organization comprised the Minister's Office, Planning and Inspection Department, Geological Survey and Exploration Department, and five state-owned mineral corporations. The major producing mines were under these corporations, but the Myanma Oil Corporation Refinery and Petroleum Products Sales Corporation were moved to the jurisdiction of the Ministry of Industry. Small-scale, family-operated mines are still privately owned, with most of the output being sold to the Government.

The Government intends to step up production of minerals during the second 4-year plan (to start in 1975–76) and envisions an annual 4% growth. During this period, Burma also hopes to achieve self-sufficiency in crude oil production and to begin exporting small amounts.

Overall economic growth in 1975 was slow, the gross domestic product (GDP) increased 3.5% for the year at constant 1969–70 prices. Although this was well short of the targeted 6+% growth rate, and a little below the previous year's 4%, it was more than the 2.7% average annual growth rate for the past decade. Considering that Burma had an estimated population growth of 2.2% per annum, real gains in the per capita GDP were not encouraging. Gross national product (GNP) was reported at about $3 billion.[3]

Metallic ores production in 1975 remained little changed from that of 1974. Industrial minerals increased in most cases in 1975, but as their unit values were generally low, the increases did little to bolster the overall economy.

Burma was nearly self-sufficient in petroleum, and as such was less affected by increases in world prices than most developing countries. However, hopes of achieving self-sufficiency in 1975 were not realized. Crude oil output, just over 900,000 tons, decreased more than 12%. Offshore petroleum exploration failed to discover commercial amounts of oil or gas.

Owing to lack of domestic funds and international investments, Burma has had to accept technical aid and foreign grants in the form of small projects. The United Nations helped the Bawdwin lead-zinc mine with exploration some years ago, and the West Germans planned to assist in "doubling output" at the mine. Insurgency problems and the kidnapping of a West German technician in March 1975, who was subsequently released, brought the project to a virtual halt. The United Nations Development Program (UNDP) started a $1.8 million, 3-year tin exploration program in the Tenasserim region and is to help drill the Monywa copper deposits.

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[1] Physical scientist, Division of International Data and Analysis.
[2] Mining Journal (London). Mining Annual Review, 1976. Pp. 395–396.
[3] Far Eastern Economic Review (Hong Kong). Asia Yearbook, 1976. Pp. 122–128.

PRODUCTION

The Burmese Government reported that value of mineral production (less petroleum) in fiscal 1975–76 was $36.7 million[4] at constant 1972 prices. Most of this can be attributed to lead, zinc, tin, and tungsten. Value of oil production during the same year was more than twice that of mineral output.[5]

[4] U.S. Embassy, Rangoon, Burma. State Department Airgram A-008, Feb. 9, 1976.
[5] U.S. Embassy, Rangoon, Burma. State Department Airgram A-041, May 11, 1976.

Table 1.—Burma: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Antimony, mine output, metal content [e]	[r] 140	170	220
Copper:			
Mine output, metal content [e]	74	71	86
Matte, gross weight	165	159	191
Iron and steel:			
Crude steel [e]	20,000	20,000	25,000
Semimanufactures [e]	30,000	30,000	35,000
Lead:			
Mine output, metal content [e]	10,100	9,300	9,960
Smelter:			
Refined lead	9,814	9,008	9,754
Antimonial lead (18%–20% antimony)	279	359	251
Manganese ore, gross weight	279	[e] 280	--
Nickel:			
Mine output, metal content	21	22	19
Speiss, gross weight	83	87	77
Silver, mine output thousand troy ounces	[r] 754	722	775
Tin, mine output:			
Metal content of tin concentrate	249	270	545
Metal content of tin-tungsten concentrate	362	252	37
Total	611	522	582
Tungsten, mine output:			
Metal content of tungsten ores	266	168	221
Metal content of tin-tungsten concentrate	248	173	34
Total	514	341	255
Zinc, mine output, metal content	3,874	3,001	4,115
NONMETALS			
Barite [2]	[e] 15,000	[e] 15,000	15,444
Cement, hydraulic thousand tons	193	172	228
Clays: [2]			
Ball clay	378	203	NA
Bentonite	337	508	914
Fire clay [3]	1,719	1,930	3,617
Industrial white clay	1,538	2,134	2,489
Feldspar [2]	91	660	762
Fluorspar	([4])	([4])	--
Graphite [2]	183	305	87
Gypsum [2]	11,325	30,085	39,260
Precious and semiprecious stones: [2]			
Jadeite kilograms	6,973	8,808	7,598
Unspecified carats	52,528	NA	76,000
Salt thousand tons	[r] 171	125	[e] 140
Sand: [2]			
Glass sand, brown	6,300	NA	5,283
Glass sand, white			2,711
Stone: [2]			
Dolomite	1,207	406	473
Limestone, crushed and broken thousand tons	600	530	687
Quartz	55	360	386
Talc and related materials, soapstone [2]	[r] 421	305	[e] 300
MINERAL FUELS AND RELATED MATERIALS			
Coal	14,450	16,811	24,588
Gas, natural:			
Gross production million cubic feet	12,000	[r] [e] 11,400	[e] 11,500
Marketed production do	[r] 5,400	4,705	5,600
Petroleum:			
Crude thousand 42-gallon barrels	7,514	7,581	6,700

See footnotes at end of table.

Table 1.—Burma: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline ---thousand 42-gallon barrels--	1,394	1,597	1,506
Jet fuel ---do----	249	223	166
Kerosine ---do----	1,677	1,686	1,440
Distillate fuel oil ---do----	1,960	1,691	1,463
Residual fuel oil ---do----	1,549	1,020	1,489
Other ---do----	442	519	619
Refinery fuel and losses ---do----	955	763	307
Total ---do----	8,226	7,499	6,990

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] Data are for fiscal year beginning April 1 of that stated.

[3] Includes fire clay powder.

[4] Revised to none.

TRADE

Burma's overall foreign trade increased from about $297 million in fiscal 1974–75 to an estimated $428 million in fiscal 1975–76. The large gain, however, reflects price increases more than an increase in volume. Mineral export levels remained relatively unchanged except for silver, which declined about 25% to 560,000 troy ounces.

Burmese Government figures show that mineral exports were valued at $12.9 million for 1975, up about 17%. Exports were mainly to People's Republic of China, North Korea, India, Singapore, the United Kingdom, and Italy.

Table 2.—Burma: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1972	1973	Principal destinations, 1973
METALS			
Antimony ore and concentrate	404	582	Belgium-Luxembourg 491; Japan 91.
Copper matte	184	--	
Lead metal, unwrought:			
Refined	8,583	7,500	People's Republic of China 4,000; Japan 3,475.
Antimonial	228	--	
Nickel matte and speiss	166	--	
Silver, unwrought ----thousand troy ounces	905	722	Japan 492; United Kingdom 129; Netherlands 101.
Tin ore and concentrate	1,015	2,365	Belgium-Luxembourg 1,965; United Kingdom 232.
Tungsten:			
Straight tungsten concentrate	492	955	Japan 305; Singapore 305; West Germany 254.
Mixed tin-tungsten concentrate	258	342	United Kingdom 218; Netherlands 124.
Zinc ore and concentrate	3,191	6,487	All to Belgium-Luxembourg.
Other metals including alloys, all forms	--	3	All to United Kingdom.
NONMETALS			
Cement	40	(1)	NA.
Gem stones other than diamond:			
Jade:			
Uncut ----thousand carats	98	96	Hong Kong 93.
Cut but not set ----do	1,525	3,227	Hong Kong 1,934; People's Republic of China 551; Switzerland 502.
Precious and semiprecious stones, n.e.s.:			
Uncut ----do	(1)	--	
Cut but not set ----do	r 4	10	Hong Kong 5.
Salt	24,826	4,015	All to Singapore.
Other nonmetals, n.e.s	r 8	26,626	Malaysia 12,529; India 7,441.
MINERAL FUELS AND RELATED MATERIALS			
Coal, anthracite and bituminous	6	--	
Petroleum refinery products thousand 42-gallon barrels	441	196	Japan 91.

r Revised. NA Not available.

1 Less than ½ unit.

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

(Metric tons unless otherwise specified)

Commodity	1972	1973	Principal sources, 1973
METALS			
Aluminum:			
Oxide and hydroxide	11	18	United Kingdom 17.
Metal including alloys:			
Unwrought	362	3	Mainly from Japan.
Semimanufactures	173	480	U.S.S.R. 228; Japan 89.
Arsenic trioxide, pentoxide, acids	49	--	
Chromium oxides and hydroxides	3	1	All from West Germany.
Copper:			
Copper sulfate	52	1	Do.
Metal including alloys:			
Unwrought	72	3	Mainly from United Kingdom.
Semimanufactures	304	286	Japan 185.
Iron and steel metal including alloys:			
Pig iron, including cast iron	1,202	2,957	West Germany 2,845.
Ferroalloys	4	46	All from Belgium-Luxembourg.
Steel, primary forms	14,682	13,264	U.S.S.R. 8,026; North Korea 5,228.
Semimanufactures	62,405	31,923	Japan 15,790.
Lead metal including alloys, all forms	38	4	Mainly from West Germany.
Manganese, oxides	173	102	All from Japan.
Mercury ... 76-pound flasks	108,582	1,045	Japan 747; Denmark 255.
Nickel metal including alloys, all forms	20	6	Mainly from West Germany.
Silver metal including alloys, all forms ... troy ounces	670	147	United Kingdom 144.
Tin:			
Oxides	1	--	
Metal including alloys, unwrought and semimanufactures	1	3	Japan 2.
Titanium oxides	71	37	West Germany 29.
Tungsten metal including alloys, all forms	(2)	--	
Zinc:			
Oxides	34	160	People's Republic of China 120.
Metal including alloys, all forms	350	543	Japan 535.
Other:			
Ores and concentrates, n.e.s	2	1	All from Hong Kong.
Oxides, hydroxides and peroxides of metals, n.e.s	55	247	Japan 239.
Base metals including alloys, all forms	(2)	13	Belgium-Luxembourg 11.
NONMETALS			
Abrasives, natural, n.e.s ... value, thousands	$1	$58	West Germany $22.
Asbestos	1,143	756	People's Republic of China 110.
Boric acid	24	1	All from Japan.
Bromine	(2)	(2)	All from United Kingdom.
Cement	820	2,024	United Kingdom 1,074.
Chalk	25	1	All from United Kingdom.
Clays and clay products:			
Crude clays, n.e.s.:			
Kaolin (china clay)	774	29	Japan 23; India 6.
Other	96	88	Japan 74.
Products:			
Refractory ... value, thousands	$605	$149	West Germany $55; Japan $52.
Nonrefractory ... do	$59	$63	People's Republic of China $40.
Diamond, industrial ... do	(2)	--	
Diatomite and other infusorial earth ... do	$5	--	
Fertilizer materials:			
Manufactured:			
Nitrogenous	55	27	All from West Germany.
Phosphatic	30,115	11,248	All from Tunisia.
Ammonia	31	115	Netherlands 73; France 23.
Graphite, natural	6	11	India 7.
Gypsum ... value, thousands	$2	(2)	All from United Kingdom.
Iodine	2	(2)	All from West Germany.
Mica, all forms	1	13	United Kingdom 9.
Precious and semiprecious stones, except diamond:			
Natural ... carats	234	33	NA.
Salt	188	40	All from Pakistan.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	8,667	6,001	Netherlands 4,388; People's Republic of China 1,163.
Caustic potash, sodium and potassic peroxides	9	1	Mainly from West Germany.
Stone, sand and gravel:			
Quartz and quartzite	11	17	All from United Kingdom.
Sand, excluding metal-bearing	28	425	Japan 422.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1972	1973	Principal sources, 1973
NONMETALS—Continued			
Sulfur:			
Elemental	1,264	1,979	West Germany 1,964.
Sulfuric acid	6	4	West Germany 2.
Other nonmetals, n.e.s.:			
Crude	252	12	West Germany 5; People's Republic of China 5.
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals, n.e.s	2	2	Mainly from Japan.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	142	--	
Coal and briquets:			
Anthracite and bituminous	126,755	64,460	All from India.
Lignite and lignite briquets	--	12,340	Do.
Coke and semicoke	508	2,032	All from West Germany.
Hydrogen, helium and rare gases	14	8	Japan 7.
Petroleum:			
Crude ______thousand 42-gallon barrels	1,304	--	
Refinery products:			
Gasoline, motor and aviation ______do	19	--	
Kerosine and jet fuel ______do	106	350	Singapore 176; Iran 129; People's Republic of China 45.
Residual fuel oil ______do	57	115	Singapore 114.
Lubricants ______do	100	131	Singapore 56; United Kingdom 22.
Mineral jelly and wax ______do	1	1	Mainly from Japan.
Other:			
Nonlubricating oils, n.e.s ______do	8,705	5,245	Iran 5,070.
Petroleum asphalt and pitch ______do	191	243	Japan 212.
Unspecified ______do	(2)	(2)	Mainly from United Kingdom.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	36	7	All from United Kingdom.

NA Not available.
[1] Imports for consumption only; does not include imports into bond.
[2] Less than ½ unit.

COMMODITY REVIEW

METALS

Antimony.—Production of mine antimony, while modest in value, has been increasing. Gross production of ore reportedly surpassed 1,000 tons in 1975. There are no modern mills or refining facilities in the country. Although individual miners have been able to sell their product to the Government if it assays over 50% antimony, much of the ore is probably lower in grade. In addition, Burma produces and exports a few tons of antimonial lead (assaying possibly 20% antimony) annually, derived as a byproduct of the Namtu lead-zinc smelter. Burma could significantly increase its antimony production by investing in a beneficiation plant.

Copper.—The copper picture was beginning to look brighter, with the development of low-grade porphyry deposits near Monywa moving nearer to reality. A pilot plant with a 50-ton-per-day ore-crushing capacity was built with Japanese aid and began operation in 1975. A Japanese drilling program completed in 1974 apparently confirmed the economic feasibility of a copper smelter. Reserves from two separate occurrences are reported to total more than 60 million tons of ore grading at least 0.7% copper. As a result, the Burmese Government was actively seeking investment capital to develop the deposit and to construct a smelter. However, the Japanese have since lost interest in the project, at least for the time being. West Germany may consider switching funds earmarked for modernizing the Bawdwin mine to the Monywa project. In addition, loan funds might be available from West Germany for refinery construction if West German firms could be guaranteed an option to bid on the refinery output.[6]

Burma has currently been producing only about 200 tons of copper matte annually as a byproduct of the Bawdwin lead-zinc output.

Lead, Zinc, and Silver.—Lead, zinc, and silver production continued to come mainly

[6] U.S. Embassy, Rangoon, Burma. State Department Airgram A-050, June 4, 1976.

from the Government-owned Bawdwin Mines Corporation enterprise near the Chinese border northeast of Mandalay. The fiscal 1974–75 output of ore was reported at around 160,000 tons,[7] but metal content continued to drop as high-grade ores were mined out. Present grade runs about 7% lead and 4% zinc, plus good values for byproduct silver, copper, antimony, and nickel. Production of refined lead was 9,754 tons, an 8% increase over 1974. The mine at Bawdwin and the old smelter at Namtu, 11 kilometers east of the mine, continued to operate at a loss owing to obsolete and wornout equipment. The planned conversion of the mine to open pit exploitation of lower grade ore has been shelved. The $26 million funding was not given final approval by the West German Credit Bureau for Reconstruction because of unstable security conditions in the northern Shan State area. Instead only $2 million will be used to "modernize" the mine, while the remainder may be redirected into more stable projects, mainly the development of the Monywa copper deposits and possible construction of a zinc smelter. Zinc concentrate is sold as such, since no zinc smelting facilities exist in the country. Output of zinc in concentrate was up 37% over the 1974 level. Construction of a domestic zinc smelter would have the added advantage of allowing the reclaiming of thousands of tons of zinc-rich tailings and slags which have been accumulated at the Bawdwin mine over the last 50 years.

Nickel and Chromium.—A nickel-chromium deposit was examined in 1975 by the UNDP's geological survey and exploration program. The ore body, located near Tiddim in the Chin Hills, apparently was considered unsuitable for commercial exploitation.

Tin and Tungsten.—Production of tin concentrate (gross weight) totaled over 760 tons, and gross weight, of mixed tin-tungsten concentrates, mostly coming from the Mawchi mine in Kayah State, totaled nearly 800 tons. Exports of tin-in-concentrate were around 600 tons. Total exports of tin concentrate in all forms were reportedly over 1,200 tons in calendar 1975. These production figures were probably understated because of a significant movement of smuggled, unreported, and inaccurately reported concentrate produced in the Tenasserim coastal region. In the first 9 months of 1975, the tin smelter in Penang, Malaysia, reported handling at least 3,000 tons of Burmese tin concentrate (gross weight). This large discrepancy between reported Burmese tin exports and Malaysian imports was more than the total official Burmese exports for the year. Some of the ore probably originated across the border in Thailand and was smuggled by boat to Penang. However, a large share of the ore may also have been Burmese, illegally mined and shipped under false certificates of origin.

The UNDP has begun a $1.8 million, 3-year exploration project in the Tenasserim region. It will attempt to detail the tin–tungsten deposits and reserves, both onshore and offshore. Insurgency problems were complicating the work in this region.

A West German loan to Burma continued the expansion and modernization of the Myanma Tin and Tungsten Corporation's open pit mining operation. The mine was undergoing expansion to an operating rate of 1,000 tons per year of tin concentrate. Krupp Industries of West Germany was doing the work.

Tungsten production for the year was over 1,200 tons of concentrate (gross weight) in all forms, including the Mawchi production mentioned above. Exports of tungsten concentrate remained steady at about 500 tons. Exports of mixed concentrate added almost 900 tons more, but the proportion of tungsten to tin in these mixtures was not reported. Continued Soviet aid to the Mawchi mine was aimed at increasing production to 1,800 tons of mixed concentrate per year.[8]

NONMETALS

Cement.—Cement production increased 56,000 tons to 228,000 tons in 1975 in response to last year's shortages. Exports, begun only in 1974, were stopped during 1975. Gypsum, used in the manufacture of cement, was mostly imported before 1972. Gypsum production has since risen steadily. Nearly 40,000 tons of gypsum were mined near Hsipaw in Shan State, a 30% increase over 1974 output and nearly 3½ times the 1973 level. Soviet financial assistance aided in developing the gypsum deposit.

[7] Latest available Bawdwin Mines figures.
[8] U.S. Embassy, Rangoon, Burma. State Department Airgram A-041, May 11, 1976.

MINERAL FUELS

Coal.—Burma has no anthracite but does mine modest amounts of lower rank coal from the Kalewa coalfield in the northwest. Production is being pushed as an import substitute. In 1975 it reached 24,588 tons, an increase of 46% over that of 1974. The coal was primarily used to generate electric power. Output could increase further, with the reported opening of new mines in 1976.

Petroleum.—Plans for attaining petroleum self-sufficiency by yearend 1975 fell short of success because of forced cutbacks in production onshore. The bottleneck was in the transport of oil from the producing fields to the refineries. There were five major producing fields in Burma during 1975 with the Mann Field yielding about one-half of the total. Production at Mann was cut back from 12,000 to 8,000 barrels per day pending completion of a 20-mile-long pipeline to a new barge jetty at Malun in 1976. Bottlenecks in the Irrawaddy River water transport system were being alleviated by the construction of new oil barges and the purchase of additional barges from abroad. Total domestic crude production for the calendar year was 6.7 million barrels (about 900,000 tons). By December, production was running around 16,600 barrels per day, down more than 21% from 1974. The much-heralded Letpando oil strike proved a disappointment as additional drilling did not bring in the production increases predicted last year. A large part of the exploration budget was currently being used to complete the exploration and define the reserves at the field. Additional exploration drilling was being conducted at Padaukkone near Thayetmyo, and at Natui near Pakokku.[9]

Several other crude pipelines were under construction or planned. A 10-inch-diameter line was reported under construction from the Letpando Field to the Chauk refinery. This should forestall transport problems once production begins at the field. A 136-mile, 10-inch-diameter line was being considered from the Mann Field to Prome. This would eliminate the necessity of barging oil to the Prome railhead and allow the major fields to produce at capacity.

The four foreign oil consortia, Esso, Martaban, AODA, and Total, described in detail in last year's chapter continued their offshore drilling program. Results have been discouraging for both the private and government drilling programs since only noncommercial occurrences of natural gas were found in 3 of 19 holes drilled in the Gulf of Martaban. Several oil shows off the Arakan coast were noncommercial because of insufficient reservoir rock. The Arakan drilling was complicated by very high thermal gradients in the sediments. All of the completed offshore wells were plugged and abandoned. The Government was reportedly considering offering for lease some of the remaining 12 offshore blocks.

Refining.—Burma had two small refineries, a 7,000-barrel-per-day plant at Chauk near the oilfields, and a 20,000 barrel-per-day operation at Syriam near Rangoon. Both ran at below capacity during 1975 because of the transport problems described above. As a result, targeted production for fiscal 1975–76 was well below the previous year's output for motor gasoline, kerosine, and diesel fuel. Only furnace oil was scheduled for a substantial increase. Despite the transport problems and resulting domestic shortages, petroleum imports were kept to a bare minimum. The only major entry was a shipment of special base oils and additives for the lube plant. Small amounts of coke and paraffin were exported.

Burma has the potential to again become an exporter of crude oil. Completion of pipeline and water transport improvements could allow a modest surplus of crude oil which would furnish a small but very much needed source of foreign exchange.

Natural Gas.—A modest amount of natural gas was produced in conjunction with oilfield operations. It was consumed mainly by local urea fertilizer plants. Demand will increase with completion of the Kyangin cement mill, under construction in 1975, and the Myanaung gas turbine powerplant, which reportedly went into operation in late 1975. A new gasfield at Shwepyitha near Prome was expected to come onstream to handle this increased demand. Actual marketed gas for 1975 increased 19%, to 5.6 billion cubic feet.

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[9] U.S. Embassy, Rangoon, Burma. State Department Airgram A-008, Feb. 9, 1976.

The Mineral Industry of Canada

By Walter C. Woodmansee [1]

In 1975, the Canadian mineral industry started a gradual recovery from the worldwide economic recession prevailing in 1974. Because Canada is a major world supplier of a number of minerals and metals, its mineral industry was strongly influenced by weak world demand that persisted through most of the year and adversely influenced sales of many mineral commodities. The economic outlook was better at yearend than at the first of the year.

These lackluster economic conditions were reflected in curtailed mineral production, idle productive capacity, deferral of modernization and/or expansion programs, and excessive mineral inventories in Canada. In addition, capital and labor costs were rising faster than market prices, thereby depressing company earnings. Labor shortages were experienced in some mining districts, and labor strikes at several mines caused production losses.

Despite this adverse economic situation, there were also favorable factors, and the Canadian mineral industry moved forward in a number of respects. The nation ranked first worldwide as a producer and supplier of zinc, nickel, silver, and asbestos, and was also a prominent source of oil and gas, coal, uranium, copper, gold, iron ore, lead, aluminum metal, potash, sulfur, and a host of other mineral commodities. In all, more than 60 minerals were extracted from more than 300 undeground and open pit mines. Key minerals lacking in Canada's resource position were bauxite and tin, chromium, manganese, and phosphate ores.

Exploration activity remained substantial and was particularly strong for certain minerals in certain regions. Several significant discoveries were reported. A large-scale search for uranium ore deposits continued in most Provinces and in the Yukon and Northwest Territories. Oil and gas exploration continued in the Territories, Arctic Islands, Beaufort Sea, and offshore from Labrador, Island of Newfoundland, and Nova Scotia. Exploration was also highly active for copper, lead, zinc, nickel, and the precious metals.

Industry considered the lull in demand and idle capacity to be temporary and was gearing up for expanded mineral production to meet growing demand in 1976 and thereafter since the recession appeared to have bottomed out. In the metals sector, new mining and metallurgical production capacity was under development or was planned for copper, lead, zinc, gold, iron ore, and iron and steel. Among the nonmetallics, relatively slack demand in the construction industry was reflected in reduced operations for construction materials such as clays, sand and gravel, lime, stone, gypsum, and cement, although a number of cement plants were undergoing expansion.

In the mineral fuels sector, new coal mines were under development or planned, particularly in the West (Alberta and British Columbia) for expanded export sales, and also for eventual shipment to the iron and steel industry and to thermal power companies in the East (Ontario). A pipeline coal slurry scheme for this shipment of Western coal to Eastern markets remained under consideration. Pipeline proposals for oil and gas from Alaska, the Yukon and Northwest Territories, the Beaufort Sea, and the Arctic Islands were under evaluation, but no decision was reached on a specific proposal. Crude oil export allocations to the United States were further reduced, and plans were made to phase out these sales. Prices for natural

[1] Supervisory physical scientist, International Data and Analysis.

gas sales in the United States were raised sharply during the year. Petro-Canada Ltd. was established as a Federal Crown company to represent the Federal Government in the oil and gas industry. Several of Canada's 41 operating oil refineries were under modernization and/or expansion. Petro-Canada and some of the Provincial Governments participated in Syncrude Canada Ltd., an operating company for a project to recover synthetic oil from the Athabasca bituminous sands. This project faced financial difficulties but was on schedule. The four operating uranium mines and mills were under expansion, and new facilities were under development.

Federal and Provincial investment and tax policies continued to cause uncertainty among potential investors in the Canadian mineral industry. The basic policy issue was whether to provide incentives for increased exploration and production and continued expansion of the mineral industry, or to provide stricter regulation of the industry and conserve mineral resources for future domestic needs. Federal and Provincial legislation were often in conflict over foreign investment and ownership. Broad policy objectives were to provide greater Canadian control and participation, expand the mineral-processing capability and sell the more advanced mineral and metal forms, insure present and future domestic mineral needs, and maximize benefits from sales of exportable surpluses of mineral resources.[2] Future transportation needs were under review, based on National as well as Provincial and regional considerations, since crude and fabricated mineral products accounted for a large share of the tonnage carried on Canadian roads and railroads and shipped from Canadian ports.

The high degree of foreign ownership continued to be of concern to Canadians. The most recent available data indicated that the United States accounted for nearly 80% of all foreign direct investment in Canada ($26 billion [3] of $33 billion), including the mineral industry, and other foreign agencies were actively seeking participation in mineral ventures in Canada. The Government acted to increase Canadian management and equity participation and to emphasize maximum benefits to Canadians. Under the Foreign Investment Review Act (FIRA), authorities continued to review foreign investment proposals. Phase II of FIRA was effective on October 15. This required prospective new investors, and those already with investments but wanting to also move into other activities, to submit proposals for approval. The Canada Development Corp. (CDC), which had been established to increase Canadian participation in investments in Canada, was active in acquiring greater shares in mining and petroleum companies.

Within the Provincial jurisdictions, Crown corporations were established to represent Provincial public interests. Legislation was introduced in Manitoba and Saskatchewan to permit direct Government participation in the mining industry. In Saskatchewan, legislation in November enabled Government purchase or expropriation in the potash mining industry, and Potash Corp. of Saskatchewan, a new Crown corporation, was formed. New tax provisions and royalty schedules became effective or were under consideration in most Provinces. The effects on the mining industry were uncertain at yearend.

The Federal Government was also studying the tax structure for operations in the Yukon and Northwest Territories. A higher tax rate, effective on January 1, 1976, was partially offset by a new resource allowance and by a tax credit to stimulate investment in production facilities. Joint Federal-Provincial mineral exploration and development programs were underway in most Provinces. Federal interests were represented by the Department of Regional Economic Planning and the Department of Energy, Mines and Resources (EMR).[4]

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[2] Information Canada. Towards a Minerals Policy for Canada—Opportunities for Choice. Ottawa, 1974, 56 pp.

[3] Where necessary, values have been converted from Canadian dollars (Can$) to U.S. dollars (US$) at the rate of Can$1.017=US$1.00, the average exchange rate for the year.

[4] Gillespie, A. W. Mineral Development—The Federal Government's Presence. Western Miner, v. 49, No. 4. April 1976, pp. 11–14.

PRODUCTION

Mine output by quantity for most mineral commodities was lower in 1975 than in 1974 because of reduced domestic and foreign demand during a period of worldwide economic recession. However, output value was higher for many commodities because of escalating prices. This was especially true for the mineral fuels—crude oil, natural gas, and coal.

According to preliminary data provided by Statistics Canada, value of mineral production reached a record $13.4 billion, compared with $11.7 billion in 1974. This was 8.7% of the gross national product, estimated at $154.7 billion (current prices). The Province of Alberta led other Provinces, with 44.8% of mineral output value because of its oil and gas production, and was followed by Ontario 17.5%, British Columbia 9.1%, Quebec 8.5%, Saskatchewan 6.2%, Newfoundland 4.2%, Manitoba 4.0%, and other Provinces and the Territories 5.7%.

Table 1.—Canada: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
METALS			
Aluminum:			
Alumina, gross weight ...thousand tons	1,134	1,265	[e] 1,070
Metal, refined ...do	942	1,021	878
Antimony [1]	[2] [r] 753	[e] 1,252	[e] 1,315
Bismuth [3]	[r] [e] 71	111	37
Cadmium [4]	1,904	1,241	1,217
Calcium ...kilograms	295,706	476,084	374,667
Cobalt:			
Mine output, Co content [5]	1,517	1,564	1,338
Metal [6]	605	326	565
Columbium and tantalum:			
Columbium concentrate (pyrochlore), Cb_2O_5 content	1,441	1,920	1,685
Tantalum concentrate, Ta_2O_5 content	77	199	179
Copper:			
Mine output, recoverable Cu content	823,943	821,380	724,053
Blister and anode	494,998	537,045	499,997
Refined	497,581	559,124	529,200
Gold ...thousand troy ounces	1,954	1,698	1,674
Iron and steel:			
Iron ore, gross weight ...thousand tons	[r] 50,213	49,976	46,868
Pig iron ...do	9,535	9,422	9,150
Ferroalloys ...do	201	248	160
Crude steel ...do	13,386	13,623	13,025
Semimanufactures (shipments) [7] ...do	[r] 10,095	10,566	[e] 10,000
Lead:			
Mine output, Pb content	387,768	320,253	[e] 358,300
Refined, primary	186,891	126,443	[e] 172,400
Magnesium, primary	6,205	5,957	4,501
Mercury ...76-pound flasks	12,500	14,000	[e] 14,000
Molybdenum	13,785	13,942	12,435
Nickel:			
Mine output, Ni content [8]	249,047	269,071	244,782
Smelter	[r] 162,500	187,600	158,341
Platinum-group metals ...troy ounces	354,223	384,618	430,000
Selenium, refined ...kilograms	[9] 263,327	[9] 333,949	[10] 303,907
Silver ...thousand troy ounces	47,488	42,810	39,101
Tellurium, refined ...kilograms	[9] 42,277	[9] 53,992	[10] 36,287
Tin, mine output, Sn content	132	324	283
Titanium:			
Ilmenite, gross weight ...thousand tons	2,082	2,017	1,825
Sorel slag (70%–72% TiO_2)	855,207	844,742	749,845
Tungsten, mine output, metal content	1,669	1,280	1,075
Uranium (U_3O_8)	4,317	4,350	5,567
Zinc:			
Mine output, Zn content ...thousand tons	1,227	1,127	1,083
Refined, primary	532,553	426,271	426,941
NONMETALS			
Asbestos ...thousand tons	1,690	1,644	1,037
Barite	92,152	78,290	[e] 87,000
Cement, hydraulic [11] ...thousand tons	10,093	10,375	9,764
Clays and products [12] ...value, thousands	$61,170	$70,621	$69,956
Diatomite [e]	500	500	500
Fluorspar [e]	137,000	[r] 106,000	64,000

See footnotes at end of table.

Table 1.—Canada: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Gypsum and anhydrite ----thousand tons--	7,611	7,225	5,674
Lime ----do----	1,715	1,823	1,714
Magnesite, dolomite, brucite ----value, thousands--	$2,656	$4,358	$4,000
Nepheline syenite ----	516,554	559,986	471,736
Potash (shipments), K_2O equivalent ----thousand tons--	4,454	5,776	4,850
Pyrite and pyrrhotite:			
Gross weight ----	23,300	44,452	e 19,000
Sulfur content e ----	r 11,650	r 24,475	10,000
Salt ----thousand tons--	5,048	5,447	5,156
Sand and gravel ----do----	r 211,792	214,629	204,080
Sodium sulfate ----	492,923	638,179	495,323
Stone[13] ----thousand tons--	83,365	88,437	88,088
Strontium minerals, celestite e ----	59,000	55,000	25,000
Sulfur, elemental byproduct:			
From smelter gas ----thousand tons--	686	663	704
From sour natural gas ----do----	7,180	6,949	6,573
From refineries ----do----	152	163	173
From tar sands ----do----	97	97	85
Talc, soapstone, pyrophyllite (shipments) ----	73,931	85,952	67,130
MINERAL FUELS AND RELATED MATERIALS			
Carbon black e ----	117,000	113,000	100,000
Coal:			
Bituminous and subbituminous ----thousand tons--	16,818	17,382	21,771
Lignite ----do----	3,654	3,485	3,549
Coke, high-temperature ----do----	5,371	5,450	5,279
Gas, natural:			
Gross production ----million cubic feet--	r 3,566,650	3,497,225	3,496,269
Marketed production ----do----	3,119,461	3,045,506	3,074,659
Natural gas liquids:			
Gross production:			
Butane ----thousand 42-gallon barrels--	r 22,145	21,775	22,411
Propane ----do----	r 33,906	33,035	34,232
Pentanes plus ----do----	r 60,693	58,360	54,460
Condensate ----do----	r 1,366	1,144	1,003
Total ----do----	r 118,110	114,314	112,106
Production returned to formation, all types ----do----	492	114	NA
Peat moss ----thousand tons--	326	369	347
Petroleum:			
Crude ----thousand 42-gallon barrels--	654,486	613,602	519,663
Refinery products:			
Gasoline, aviation ----do----	1,335	1,413	1,448
Gasoline, other ----do----	200,791	212,348	219,917
Jet fuel ----do----	21,279	23,713	24,954
Kerosine ----do----	26,236	25,555	25,234
Distillate fuel oil ----do----	r 160,843	164,733	154,417
Residual fuel oil ----do----	114,438	123,151	110,721
Lubricants ----do----	r 3,416	4,335	3,827
Other:			
Liquefied petroleum gas ----do----	7,529	8,095	8,322
Petrochemical feedstocks ----do----	r 12,035	10,390	8,837
Asphalt ----do----	17,963	18,103	18,007
Petroleum coke ----do----	1,165	1,103	1,192
Unspecified products ----do----	r 13,595	19,542	11,340
Refinery fuel and losses ----do----	r 33,343	37,977	33,187
Total ----do----	r 613,968	650,458	621,403

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

1 Antimony content of antimonial lead alloys, flue dust, and dore slag.

2 Antimony content of smelter products, excludes output from New Brunswick, which is believed to be small.

3 Refined metal and bullion plus recoverable bismuth content of concentrates exported.

4 Refined metal from domestic ores plus cadmium content of exported ores and concentrates.

5 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.

6 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.

7 Includes shipments of ingots from primary plants for rolling elsewhere.

8 Refined nickel plus nickel content of oxide produced plus recoverable nickel in matte exported.

9 Refinery output from all sources, including imports and secondary sources.

10 Recoverable selenium content of blister copper treated at domestic refineries, plus refined selenium from domestic primary material.

11 Cement shipped and/or used by producers.

12 Includes value of bentonite and products from common clay, stoneware clay, fire clay, and other types of clay.

13 Crushed, building, ornamental, paving and other similar uses.

Table 2.—Canada: Principal mineral production, by value, for 1975

(Million dollars)

Commodity	Value
Metals:	
Copper	1,017
Gold	276
Iron ore	923
Lead	152
Nickel	1,109
Silver	177
Zinc	895
Other	265
Total	4,814
Nonmetals:	
Asbestos	267
Cement	265
Clay products	70
Potash	347
Sand and gravel	260
Stone	171
Sulfur	89
Other	267
Total	1,736
Mineral fuels:	
Coal	576
Natural gas	1,729
Natural gas liquids	768
Petroleum, crude	3,781
Total	6,854
Grand total	13,404

Source: Statistics Canada.

TRADE

Because Canada exported about 60% of its mineral production (in terms of value), including about one-half to the United States, reduced world demand for mineral commodities contributed to a continuing unfavorable trade balance in 1975. Minerals accounted for about one-third of Canada's total export value for the year. Total mineral export value was down only slightly, compared with 1974 data, but was down about 7% excluding the mineral fuels.

According to preliminary data from Statistics Canada, principal mineral commodity exports in 1975, in terms of value, were crude petroleum and natural gas, all of which went to U.S. markets. These and other principal mineral exports (table 4) totaled about $9 billion in 1975, of which nearly three-fourths were to the United States. This was 28% of total export value of $32.8 billion.

Principal mineral commodity import values were as follows, in million dollars:

	1974	1975
Crude petroleum	$2,646	$1,299
Coal	303	576
Semifabricated steel	472	277
Fuel oil	236	108

Essentially all imports of coal were from the United States. Venezuela and the Middle East were principal sources of crude oil.

Table 3.—Canada: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974	Principal destinations, 1974
METALS			
Aluminum:			
Alumina excluding abrasive grades, Al content	29,386	31,079	United States 22,731.
Metal:			
Scrap	53,361	53,475	United States 43,060.
Unwrought	700,152	689,877	United States 377,223; Japan 73,368; United Kingdom 69,719.
Semimanufactures [2]	28,631	48,446	United States 20,693; Portugal 6,403; United Kingdom 4,835.
Cadmium	1,479	901	United States 642; United Kingdom 248.
Calcium kilograms	171,594	339,060	United States 249,793; Mexico 54,930.
Cobalt:			
Metal	551	479	United States 457.
Oxides and salts, gross weight	512	673	All to United Kingdom.
Columbium concentrate [3] kilograms	303	3,933	All to United States.
Copper:			
Ore and matte, Cu content	347,616	344,270	Japan 286,494.
Slag, skimmings, sludge, Cu content	2,559	493	West Germany 272; United States 148; United Kingdom 73.
Metal:			
Scrap:			
Unalloyed	25,298	15,803	United States 7,720; Belgium-Luxembourg 3,693.
Copper alloys	24,845	23,265	United States 11,946; Belgium-Luxembourg 2,786.
Unwrought, unalloyed	288,498	288,335	United States 103,278; United Kingdom 91,712.
Semimanufactures: [2]			
Unalloyed	50,266	45,812	United States 22,848.
Copper alloys	16,697	14,647	United States 10,812.
Iron and steel:			
Iron ore thousand tons	37,668	37,448	United States 19,810; United Kingdom 4,832; Japan 4,240.
Metal:			
Scrap do	636	263	United States 202; Japan 24.
Pig iron and related materials do	618	570	United States 358; Netherlands 85.
Ferroalloys:			
Ferromanganese	3,024	10,247	United States 10,041.
Ferrosilicon	46,574	47,436	United States 29,660; United Kingdom 15,419.
Other	5,803	3,465	United States 2,220; Brazil 516.
Steel ingots and other primary forms	123,804	248,767	United States 156,761; Belgium-Luxembourg 31,707; Iran 25,494.
Semimanufactures:			
Bars, rods, angles, shapes, sections	311,832	323,895	United States 248,357.
Universals, plates, sheets, strip	676,998	613,387	United States 453,894.
Rails and accessories	124,225	137,530	United States 62,501; Mexico 35,625; Bangladesh 15,674.
Wire	54,476	61,264	United States 58,684.
Tubes, pipes, fittings	196,754	349,966	United States 291,442.
Castings and forgings, rough	219,947	189,408	United States 185,939.
Lead:			
Ore and concentrate, metal content	201,764	194,088	Japan 112,832; United States 24,827.
Metal:			
Scrap including alloy scrap	21,757	9,841	Netherlands 2,946; Italy 1,523; Republic of Korea 1,332.
Unwrought, unalloyed	113,672	76,026	United Kingdom 31,718; United States 27,944.
Semimanufactures [2]	9,067	9,148	United States 8,116.
Magnesium metal	3,240	3,252	United Kingdom 1,866; United States 551.
Mercury [3] 76-pound flasks	17,440	10,615	All to United States.
Molybdenum ore and concentrate, Mo content [4]	11,312	12,690	Belgium-Luxembourg 4,901; Japan 3,113.
Nickel:			
Ore, matte and speiss, Ni content	91,068	85,240	Norway 42,410; United Kingdom 34,034; Japan 8,691.
Oxide, Ni content	59,710	51,118	United States 32,766; Belgium-Luxembourg 7,754.

See footnotes at end of table.

Table 3.—Canada: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974	Principal destinations, 1974
METALS—Continued			
Nickel—Continued			
Metal:			
Scrap	2,187	2,654	United States 2,330.
Unwrought	120,666	120,344	United States 75,339; People's Republic of China 20,004; United Kingdom 14,890.
Semimanufactures [2]	6,638	8,906	United States 6,463; United Kingdom 1,206.
Platinum-group metals:			
Concentrates, residues and matte, metal content ----troy ounces	447,138	524,723	United Kingdom 487,289.
Metal:			
Scrap ----do	31,646	30,872	United States 27,846.
Other ----do	13,459	26,354	United States 21,469; United Kingdom 4,638.
Selenium metals and salts, Se content kilograms	373,352	420,933	United States 275,376; United Kingdom 117,390.
Silver:			
Ore and concentrate, Ag content thousand troy ounces	26,202	19,383	United States 10,816; Japan 5,516.
Metal, refined ----do	22,905	21,339	United States 20,725.
Tin ore and concentrate, Sn content [4]	318	1,316	United Kingdom 895; United States 205.
Titanium:			
Ilmenite and ilmenite sand [3 5]	200,252	183,044	All to United States.
Titanium slag 70% TiO_2 [3]	91,015	167,015	Do.
Uranium and thorium concentrates value, thousands	$64,150	$51,309	United States $27,974; United Kingdom $22,121.
Zinc:			
Ore and concentrate, Zn content	856,497	866,697	Belgium-Luxembourg 228,413; Japan 194,541; United States 164,019.
Metal:			
Scrap, dross, ashes, and blue powder	12,276	24,130	United States 14,600; United Kingdom 3,719.
Unwrought	422,877	296,777	United States 238,615; United Kingdom 30,239.
Semimanufactures [2]	4,850	4,798	United States 3,341; United Kingdom 680.
Other, n.e.s.:			
Ore and concentrate, gross weight	718,564	608,321	United States 157,090; Saudi Arabia 137,465; Netherlands 95,005.
Ash and residue containing nonferrous metals	5,078	15,979	United States 15,078.
Oxides, hydroxides and peroxides of metals	82,984	63,901	United States 55,504.
Metals:			
Base metals including alloys, all forms	863	1,151	United States 784.
Precious metals [6] troy ounces	22,405	54,578	United Kingdom 42,885; United States 7,060.
NONMETALS			
Abrasives:			
Natural	30	366	Mainly to United States.
Fused alumina, crude and grains	171,322	184,182	United States 173,170.
Silicon carbide, crude and grains	92,983	91,877	Mainly to United States.
Grinding and polishing wheels and stones ----value, thousands	$1,168	$950	United States $423; Australia $162; U.S.S.R. $122.
Asbestos:			
Crude	32	171	United States 144.
Milled fiber, all grades thousand tons	1,709	1,652	United States 667.
Barite, crude	45,370	31,258	United States 25,868; Venezuela 5,386.
Cement, portland ----thousand tons	1,279	1,148	Mainly to United States.
Clays and clay products (including all refractory brick):			
Crude clays, including refractory clay ----do	1,060	1,078	Do.
Products:			
Refractory (including nonclay bricks) ----value, thousands	$12,706	$13,174	United States $7,422.
Nonrefractory ----do	$2,345	$2,130	United States $2,067.

See footnotes at end of table.

Table 3.—Canada: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974	Principal destinations, 1974
NONMETALS—Continued			
Fertilizer materials:			
Nitrogenous ------thousand tons--	772	600	Mainly to United States.
Potassic ------do----	7,129	9,044	United States 6,330.
Mixed ------do----	764	723	United States 558.
Ammonia ------do----	64	96	Mainly to United States.
Gypsum, crude ------do----	5,754	5,212	United States 5,157.
Lime ------	338,454	386,650	Mainly to United States.
Nepheline syenite ------	408,225	454,699	United States 425,688.
Pigments, mineral, including processed iron oxides ------	16,672	14,467	United States 12,749.
Precious and semiprecious stones, except diamond --value, thousands--	$348	$635	United States $320; United Kingdom $78; West Germany $73.
Salt and brines ------do----	$6,051	$6,851	United States $6,683.
Sand and gravel ------thousand tons--	799	357	Mainly to United States.
Sodium sulfate ------	143,037	236,715	United States 231,277.
Stone:			
Limestone, crude, crushed and refuse ------thousand tons--	1,534	1,219	All to United States.
Quartzite ------do----	103	144	Do.
Rough building and crude, n.e.s. do----	362	479	United States 478.
Sulfur:			
Crude and refined ------do----	3,492	4,251	United States 1,182; Australia 430.
Sulfuric acid and oleum ----do----	123	249	Mainly to United States.
Talc, steatite, soapstone, pyrophyllite [3] ------	7,641	5,074	All to United States.
Other nonmetals, crude, n.e.s value, thousands--	$48,001	$43,776	United States $10,734; Netherlands $9,429; West Germany $5,620.
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous ------thousand tons--	10,908	10,774	Japan 9,973.
Coke from coal ------	367,916	260,892	United States 161,457; West Germany 67,429.
Fuel briquets, coal and coke ------	25,060	37,858	All to United States.
Gas, natural ------million cubic feet--	1,030,913	960,713	Do.
Petroleum:			
Crude -thousand 42-gallon barrels--	420,060	333,456	Do.
Refinery products:			
Gasoline ------do----	4,663	1,672	United States 1,644.
Distillate fuel oil ------do----	5,108	4,837	United States 3,415.
Residual fuel oil ------do----	36,295	29,894	United States 22,055; Sweden 4,434.
Lubricants ------do----	18	42	United States 33.
Other:			
Liquefied petroleum gas do----	36,229	35,286	United States 32,356; Japan 2,925.
Asphalt ------do----	514	636	United States 623.
Petroleum coke and pitch coke ------do----	11	137	United States 77; United Kingdom 60.
Total ------do----	82,838	72,504	
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals-do----	3,036	441	United States 436.

[1] Many figures for 1973 are revised from those appearing in the previous edition of this chapter owing to use of revised Canadian exports.
[2] May include relatively minor quantities of certain shapes not normally included among semimanufactures.
[3] Partial figures, data given are U.S. imports for consumption only.
[4] Includes some scrap.
[5] Largely, if not all, used in the production of heavy aggregate.
[6] Excludes scrap and sweepings valued in thousands at $7,308 in 1973 and $21,791 in 1974.

Table 4.—Canada: Principal mineral commodity export values
(Million dollars)

Commodity	1974	1975 Total	1975 Share to United States
Aluminum, metal and alloys	513	438	266
Asbestos	345	302	99
Copper:			
Ore, concentrate, scrap	648	330	56
Metal, including alloys	654	475	178
Fertilizers and fertilizer materials	421	456	379
Iron and steel:			
Iron ore, concentrate	543	686	429
Steel forms, semifabricated	195	165	105
Mineral fuels:			
Natural gas	492	1,092	1,092
Petroleum, crude	3,420	3,052	3,052
Petroleum and coal products	611	638	505
Nickel:			
Ore, concentrate, scrap	439	516	67
Metal, including alloys	440	414	310
Zinc:			
Ore, concentrate, scrap	319	298	39
Metal, including alloys	223	202	135
Total	9,263	9,064	6,712

Source: Statistics Canada.

Table 5.—Canada: Imports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite thousand tons	2,656	2,716	Guyana 1,137; Guinea 882; Surinam 317.
Alumina do	853	884	Australia 385; United States 204; Jamaica 166.
Metal including alloys:			
Scrap	10,286	5,836	United States 5,634.
Unwrought	44,938	47,950	United States 36,929; United Kingdom 5,346.
Semimanufactures (including cable)	107,150	108,142	United States 100,718.
Antimony oxides	675	796	United Kingdom 582; United States 134; Bolivia 80.
Chromium:			
Ore and concentrates, Cr content	25,036	28,776	United States 22,062; Philippines 3,408; Republic of South Africa 2,422.
Oxide and hydroxide	1,468	1,414	United States 907; France 353.
Copper:			
Ore and concentrates (including scrap) Cu content	52,835	54,329	Chile 28,421; United States 19,956.
Copper sulfate	1,298	521	Netherlands 158; United States 143; Belgium-Luxembourg 134.
Metal:			
Unalloyed:			
Unwrought	17,179	22,106	United States 11,549· Chile 7,446; Republic of South Africa 2,405.
Semimanufactures	7,502	5,632	United States 4,881.
Alloys, unwrought and semimanufactures (including cable) [2]	17,618	17,467	United States 13,319.
Iron and steel:			
Iron ore thousand tons	2,689	2,333	United States 1,663; Brazil 536.
Scrap do	915	767	United States 766.
Pig iron and related materials	6,769	17,194	United States 17,037.
Ferroalloys:			
Ferrochrome	34,727	38,392	Republic of South Africa 27,653; United States 5,077; Brazil 4,393.
Ferromanganese (includes spiegeleisen)	24,050	17,114	Republic of South Africa 8,573; France 5,147; United States 3,308.
Silicomanganese (includes silico spiegeleisen)	9,752	541	United States 427; Republic of South Africa 114.

See footnotes at end of table.

Table 5.—Canada: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974	Principal sources, 1974
METALS—Continued			
Iron and steel—Continued			
Ferroalloys—Continued			
Ferrosilicon	12,920	10,560	United States 4,462; Yugoslavia 4,130.
Ferrotungsten	78	186	United Kingdom 175.
Ferrovanadium	152	370	United States 239; United Kingdom 49; Republic of South Africa 47.
Other	29,368	17,699	Greece 7,819; United States 5,430; Dominican Republic 2,729.
Steel, primary forms	86,512	47,804	United States 41,596.
Semimanufactures:			
Bars, rods, angles, shapes, sections:			
Wire rod	211,259	295,766	Japan 78,389; West Germany 63,852; Czechoslovakia 52,042.
Other bars and rod [2]	237,477	478,950	United States 286,769; Japan 98,683.
Angles, shapes, sections	388,752	594,210	United States 247,637; Japan 110,734; Belgium-Luxembourg 92,644.
Universals, plates, sheets, strip	876,914	1,323,172	United States 682,570; Japan 410,868.
Rails and accessories	15,457	34,570	United States 31,412.
Wire	68,269	78,741	United Kingdom 22,395; United States 15,744; Japan 12,818.
Tubes, pipes, and fittings	245,743	250,206	United States 135,320; Japan 72,715.
Castings and forgings	138,558	134,370	United States 124,024.
Lead:			
Oxide	1,810	5,312	Mexico 3,254; United States 1,803.
Metal including alloys, unwrought and semimanufactures [2]	4,771	12,059	Japan 6,769; United States 4,380.
Magnesium metal including alloys	5,086	7,484	United States 6,371.
Manganese:			
Ore and concentrates, Mn content	133,397	125,103	Gabon 36,611; United States 32,538; Brazil, 31,086.
Metal	4,204	3,935	Republic of South Africa 3,028; United States 572.
Mercury ....76-pound flasks	1,397	3,157	Spain 1,695; United States 483; Mexico 400.
Molybdenum, molybdic oxide, gross weight	90	86	All from United States.
Nickel:			
Ore and concentrates (including scrap) Ni content	13,208	10,677	United Kingdom 4,720; United States 3,070; Australia 1,542.
Metal including alloys:			
Unwrought	14,643	15,234	Norway 15,073.
Semimanufactures [2]	4,700	6,423	United States 5,499; United Kingdom 716.
Platinum-group metals ..troy ounces	63,952	49,124	United States 25,145; United Kingdom 18,294; Republic of South Africa 5,685.
Silver metal ..thousand troy ounces	8,755	29,246	United States 23,615; United Kingdom 5,000.
Sodium metal	9,622	9,199	United States 9,178.
Tin metal, unwrought and semimanufactures [1]	5,590	5,668	United States 3,560.
Titanium:			
Dioxide, pure and extended	4,684	4,311	United States 2,317; United Kingdom 1,048; West Germany 890.
Metal	252	416	United States 393.
Tungsten ore and concentrates, W content	5	--	
Zinc:			
Ore and concentrates (including scrap) Zn content	3,709	2,125	United States 2,105.
Oxide and peroxide	2,208	2,290	United States 1,611; Mexico 422.
Metal:			
Blue powder	814	250	United States 212; United Kingdom 39.
Unwrought	18,521	7,021	Belgium-Luxembourg 3,270; United States 1,842; Mexico 1,016.
Semimanufactures [2]	1,361	3,292	United States 2,557; Mexico 343.
Zirconium metal alloys	140	223	United States 208.
Other:			
Ore and concentrates (including scrap) gross weight	164,350	101,388	United States 58,593; Australia 18,504; Peru 14,716.
Oxides, hydroxides and peroxides of metals	23,882	4,973	United States 4,058.

See footnotes at end of table.

Table 5.—Canada: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974	Principal sources, 1974
METALS—Continued			
Other—Continued:			
Metals:			
Base metals, including alloys, all forms	2,222	2,692	United States 1,292; Norway 682; Finland 278.
Precious metals [2] troy ounces	46,446	70,198	United States 63,573.
NONMETALS			
Abrasives:			
Natural	12,918	13,106	United States 13,006.
Grinding and polishing wheels and stones value, thousands	$6,805	$8,170	United States $6,020.
Asbestos	4,499	3,932	Republic of South Africa 3,181; United States 751.
Barite, crude	28,649	11,678	United States 11,141.
Cement	121,289	262,444	United States 261,309.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	205,179	263,529	United States 223,080; Greece 40,449.
Fire clay	31,868	44,707	United States 44,660.
Fuller's earth	12,310	8,606	All from United States.
Kaolin (china clay)	185,455	181,260	United States 147,214; United Kingdom 33,842.
Other (including refractory clay)	93,584	108,403	United States 108,351.
Products:			
Refractory (including nonclay bricks) value, thousands	$35,149	$55,872	United States $49,014.
Nonrefractory do	$15,957	$27,717	Japan $8,654; Italy $6,801.
Cryolite, crude	4,977	8,890	Denmark 6,391; United States 2,053.
Diamond:			
Gem, not set or strung carats	116,250	128,872	Israel 42,479; Belgium-Luxembourg 36,671; Republic of South Africa 14,820.
Industrial do	887,024	1,126,199	United States 817,125; Ireland 163,693.
Dust and powder do	454,129	611,639	United States 593,664.
Diatomite and other infusorial earth	34,012	29,098	United States 29,068.
Fertilizer materials:			
Nitrogenous	59,195	62,344	United States 50,436.
Phosphatic:			
Phosphate rock thousand tons	3,337	3,366	United States 3,363.
Other	59,718	93,026	United States 91,078.
Potassic	44,829	51,637	All from United States.
Other including mixed	88,547	75,861	United States 75,455.
Fluorspar	153,816	142,246	Mexico 106,936; United Kingdom 23,157.
Gypsum	83,725	56,251	United States 38,463; Mexico 17,615.
Iodine	159	282	Japan 245.
Lime	14,740	21,024	United States 20,999.
Magnesium:			
Dolomite, calcined	1,328	3,108	All from United States.
Dead burned or sintered	53,708	45,412	United States 36,917; Yugoslavia 8,053.
Other	1,759	2,300	United States 2,150.
Mica, crude	5,786	4,876	Mainly from United States.
Pigments, mineral, including processed iron oxides	6,330	8,185	United States 3,843; West Germany 2,759; Spain 890.
Precious and semiprecious stones, except diamond value, thousands	$6,386	$8,705	United States $2,563; India $898.
Salt and brines	841,936	736,573	United States 436,625; Mexico 276,031.
Sodium carbonate (including sal soda)	179,189	201,364	United States 201,145.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	162,806	128,522	United States 94,100; United Kingdom 13,085.
Caustic potash, sodic and potassic peroxides	1,926	2,062	United States 1,769; West Germany 239.
Sodium sulfate (Glauber's salt)	27,038	22,519	United States 13,106; United Kingdom 6,363; Belgium-Luxembourg 3,050.

See footnotes at end of table.

Table 5.—Canada: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974	Principal sources, 1974
NONMETALS—Continued			
Stone, sand and gravel:			
Stone:			
Dimension stone:			
Crude and partly worked	32,955	35,402	United States 20,599; Republic of South Africa 8,380; Italy 5,415.
Worked value, thousands	$2,735	$4,529	Italy $2,427; United States $1,888.
Limestone thousand tons	2,124	2,525	All from United States.
Pumice and lava	17,179	3,916	United States 3,346; Italy 569.
Quartz, silex and crystallized	991	1,671	United States 1,656.
Other, including crushed and broken	56,225	92,985	United States 91,450.
Sand and gravel:			
Silica sand thousand tons	986	956	Mainly from United States.
Other do	1,031	1,573	Do.
Sulfur:			
Elemental	35,759	31,389	United States 31,345.
Sulfuric acid (including oleum)	65,727	124,739	United States 96,888.
Talc, steatite, soapstone, pyrophyllite	29,967	36,248	United States 35,947.
Vermiculite, crude	39,015	44,738	United States 39,549; Republic of South Africa 5,189.
Other nonmetals, n.e.s.:			
Crude value, thousands	$4,262	$3,954	United States $3,658.
Oxides and hydroxides of magnesium, strontium, barium	54,945	60,623	United States 59,886.
Building materials of asphalt, asbestos and fiber cements, and unfired nonmetals, n.e.s value, thousands	$4,628	$9,221	United States $7,809; United Kingdom $1,176.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural do	$495	$593	United States $502.
Carbon black	9,088	7,104	United States 6,795.
Coal, all grades thousand tons	14,831	12,381	Mainly from United States.
Coke from coal do	358	509	United States 377; West Germany 73; United Kingdom 59.
Fuel briquets, coal and coke	12,481	18,819	All from United States.
Gas, natural million cubic feet	14,700	9,228	Do.
Hydrogen and other rare gases	16,697	9,122	United States 8,774.
Petroleum:			
Crude thousand 42-gallon barrels	328,154	291,120	Venezuela 128,126; Iran 72,549; Saudi Arabia 33,265.
Refinery products:			
Gasoline:			
Aviation do	112	31	United States 19; Netherlands Antilles 12.
Motor do	222	31	Netherlands Antilles 30.
Kerosine do	(3)	1	All from United States.
Jet fuel do	2,462	1,839	United States 527; Venezuela 459; Netherlands Antilles 450.
Distillate fuel oil do	7,235	3,406	Netherlands Antilles 1,690; Venezuela 1,218.
Residual fuel oil do	29,061	19,240	Venezuela 9,414; Netherlands Antilles 4,426; United States 2,898.
Lubricants (including grease) do	1,552	1,709	United States 1,288; Trinidad and Tobago 341.
Other:			
Liquefied petroleum gas do	274	73	Mainly from United States.
Naphtha do	113	104	All from United States.
Asphalt and road oils do	113	45	Mainly from United States.
Petroleum and pitch coke do	3,507	4,103	United States 4,090.
Petroleum jelly and wax do	88	72	Mainly from United States.
Unspecified do	1,355	1,097	United States 944; Puerto Rico 113.
Total do	46,094	31,751	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	95,747	119,322	United States 66,087; West Germany 24,757; Australia 14,234.

[1] Many figures for 1973 are revised from those appearing in the previous edition of this chapter owing to use of revised Canadian imports.
[2] May include relatively minor quantities of certain shapes not normally included among semimanufactures.
[3] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—Production of alumina and aluminum metal, derived wholly from imported raw materials, was substantially below that of 1974, owing to reduced domestic and world demand. Aluminum Co. of Canada Ltd. (Alcan) produced 760,000 tons of primary metal, 13% below that of 1974, according to the company's annual report. Alcan shipments of all aluminum forms were 1,272,000 tons, down 16% from 1974, and ingot shipments were 560,000 tons, down only 4%. Alcan smelters were operated at 79% of rated capacity since April, when staged plant reductions went into effect. Canadian Reynolds Metals Co. Ltd., Canada's other producer, operated at about 85% of capacity. Reynolds' shipments were 25% below those of 1974. Despite the heavy cutbacks in production rates throughout the industry, inventory levels remained excessive at yearend.

Modernization and expansion programs planned by both companies were deterred or suspended indefinitely because of the industry's relatively poor year. Alcan had initiated ingot capacity expansions of 22,000 tons per year at Arvida, Quebec, and Kitimat, British Columbia, scheduled for completion in 1975 and 1976, respectively, under a 10-year, $1 billion program that was originally scheduled to increase Alcan ingot capacity by 270,000 tons. Reynolds continued planning for a 135,000-ton-per-year expansion at its Baie Comeau smelter in Quebec. These new facilities will eventually increase total annual ingot capacity of the two companies from 1.1 million tons to 1.5 million tons.

Construction was in progress on Alcan's second cold-rolling mill at Kingston, Ontario. This will increase annual sheet capacity to 172,000 tons.

General Investment Corp., the Quebec provincial investment agency, considered new $500 million, 225,000-ton-per-year smelter and fabricating plants in partnership with National Southwire Aluminum Co. (U.S.). In April, a plant site was selected at St. Augustin, 18 kilometers west of Quebec City.

Copper.—Primary copper was derived from a variety of ores including porphyry deposits and vein-type deposits of the base metals, precious metals, and nickel. Mine production was from about 70 operations throughout Canada early in the year, and exploration was widespread. Outputs of mine, smelter, and refined copper were lower than those of 1974 during a period of reduced domestic demand and depressed international markets. Mine production, valued at slightly over $1 billion, was substantially below the $1.4 billion value for

Table 6.—Canada: Aluminum production facilities, 1975

Company	Plant location	Products	Rated annual capacity (thousand metric tons)
Aluminum Co. of Canada Ltd.	Arvida, Quebec	Sized bauxite, calcined alumina, primary aluminum and alloy ingots, super-purity aluminum.	[1] 1,258 [2] 406
Do	Beauharnis, Quebec	Primary aluminum and alloy ingots.	47
Do	Shawinigan, Quebec	do	83
Do	Isle Maligne (Alma), Quebec.	do	100
Do	Kitimat, British Columbia.	do	271
Canadian Reynolds Metals Co., Ltd.	Baie Comeau, Quebec	Primary aluminum and alloy ingots, extrusion billets, rolling blocks, wire bars.	158

[1] Alumina.
[2] Aluminum.

Source: Department of Energy, Mines and Resources, Ottawa.

1974, owing to soft copper prices prevailing in world markets throughout the year. Domestic shipments totaled 185,194 tons, compared with 247,984 tons in 1974. Many mines were operated below capacity levels, and new mine developments were curtailed.

In the Sudbury District, Ontario, where copper is a coproduct of nickel, production was affected by labor contract negotiations. Operations of Falconbridge Nickel Mines Ltd. were delayed by a 10-week strike during these negotiations. Falconbridge conducted a smelter environmental improvement program, scheduled for completion in 1977, and continued development of the Lockerby mine, 32 kilometers south of Sudbury, where production was at partial capacity in 1975 and was scheduled for full capacity (700,000 tons of ore per year) in 1977.

The International Nickel Co. of Canada Ltd. (INCO), the leading producer in the Sudbury District, made improvements in the feed preparation facility and worked on two waste water treatment plants at the Copper Cliff refinery. Mining at INCO's Clarabelle open pit ended in 1974, but will resume following development of a new ore extension.

A $140 million expansion was underway at the Kidd Creek base metal-silver mine and concentrator of Texasgulf Canada Ltd. in the Timmins District, Ontario, where copper content has averaged about 1.75%. A second shaft was being sunk to the 1,600-meter level. A new $300 million smelter-refinery complex (annual capacity 59,000 tons of refined copper), in the design engineering and early construction stage, will employ continuous smelting and electrolytic refining technology developed in Japan. The mine expansion will increase annual ore production capacity from 3.2 million tons to 4.5 million tons, scheduled for 1978. CDC holds a 30% interest in the project.

Elsewhere in Ontario, Mattagami Lake Mines Ltd., in which Noranda Mines Ltd. and Placer Development Corp. Ltd. hold interests, continued development of the Lyon Lake copper-zinc-silver property, Sturgeon Lake area, western Ontario, where the ore contains 1.15% Cu. Sinking was started on a 500-meter shaft. Ore output was to be 900 tons per day, starting in 1977.

Continuing exploration has increased ore reserves to 13.8 million tons averaging 1.7% Cu at the Thierry deposit, Pickle Crow District, northwest Ontario. Ore production, scheduled for 1976, was expected to be 4,000 tons per day. The operating company is Union Minière Exploration and Mining Corp. Ltd.

In Quebec, the late 1974 discovery of high-grade copper-zinc-silver ore by Selco Mining Corp. Ltd. during exploratory drilling near Mattagami led to heavy claim-staking activity by a number of companies in western Quebec and eastern Ontario.

Noranda Mines, Horne Div., at Noranda, suspended a planned expansion program at the Horne smelter early in the year, owing to a shortage of concentrate feed. Curtailed capital expenditures at the smelter included the acid recovery plant and the oxygen plant for the continuous smelter reactor.

Expansion at the Murdochville concentrator-smelter of Gaspé Copper Mines Ltd., a Noranda subsidiary, was delayed by problems in the vat leaching section.

Patino Mines (Quebec) Ltd. established wholly owned Lemoine Mines Ltd. as operator at its new high-grade copper-zinc-precious metal mine under development 33 kilometers southwest of Chibougamau, Quebec. Sinking of a 330-meter shaft and construction of a concentrator were in progress. Ore production at a rate of 360 tons per day was anticipated by 1976.

Hudson Bay Mining & Smelting Co. Ltd. continued modernization and environmental improvement programs at the Flin Flon metallurgical complex at the Manitoba-Saskatchewan border. Development at the Centennial copper-zinc mine included an incline and an internal shaft, started in January. Shaft-sinking started at the company's new Westarm mine in April. The shaft was scheduled for completion, 500 meters deep, in 1976.

In British Columbia, where major open pit mines have been developed at low-grade porphyry deposits in recent years, deliveries to Japan were cut back at customers' requests. Production and exports were reduced as much as 50% by some companies.

Despite this depressed market and oversupply position, development of new sources of copper continued in British Columbia. Afton Mines Ltd., a subsidiary of Teck Mining Ltd., planned open pit development and a 23,000-ton-per-year smelter near

Kamloops. This $80 million project moved forward following a Provincial Government announcement of proposed legislation for a royalty incentive equivalent to $0.02 per pound for 4 years.[5]

Gibraltar Mines Ltd. shut down its mine 60 kilometers north of Williams Lake, British Columbia, for 3 weeks in August and resumed production at a rate of 30,000 tons of ore per day, well below the peak of 40,000 tons per day in 1973. Reserves at a cutoff-grade of 0.25% Cu were 319 million tons of ore at 0.36% Cu.[6]

Valley Copper Mines Ltd., a subsidiary of Cominco Ltd., postponed a decision on a copper smelter in British Columbia pending a decision on development of the large low-grade Lake Zone ore body, which extends into the Bethlehem Copper Corp. Ltd. property in the Highland Valley area.

A study evaluating concentrator-smelter processes for British Columbia indicated that newly developed technology should be considered to meet strict environmental requirements.[7]

Shell Canada Ltd. reported a significant copper discovery in the Coates Lake area, Nahanni District, Northwest Territory, and planned an extensive exploration program. Other companies were staking claims over a large area of the district.

Gold.—Mine production was slightly below that of 1974. About 74% of this output was from auriferous quartz veins at 22 lode operations; 25.5% was a byproduct of base metal mining; and 0.5% was from placer operations mainly in the Yukon Territory.[8]

In Ontario, the leading Province in gold production with 46% of total output, production was down slightly from that of 1974. This decrease was held to a minimum by high gold prices prevailing in late 1974 and early 1975. With rising costs, there was relatively little exploration and development activity for gold in the Province. Rengold Mines Ltd. was expected to be producing gold bullion in the Missinabic area, 270 kilometers northeast of Sault St. Marie, before yearend. The Renabie mine, shut down in 1970, was being dewatered and reactivated. Mill restoration was underway for a milling rate of 300 tons per day. Other companies were considering reopening several adjoining properties. Amoco Canada Petroleum Ltd. reported a significant discovery in the Detour Lake area, 200 kilometers northeast of Timmins, near the Quebec border, and was diamond-drilling the deposit during the year.

The favorable gold prices early in the year also spurred exploration and development activity in Quebec. A number of old

[5] The Northern Miner. Afton to Proceed With Mine, Smelter in British Columbia. V. 61, No. 32, Oct. 23, 1975, p. 1.

[6] Roberts, R. J. Gibraltar Milling 34,000 Tons Per Day. The Northern Miner, v. 61, No. 28, Sept. 25, 1975, pp. 1, 17.

[7] Peters, E. Alternative Processes Are Considered for a British Columbia Copper Smelter. The Northern Miner, v. 61, No. 7, May 1, 1975, pp. 39, 46.

[8] Hogan, J. Gold. Canadian Mineral Survey 1975. Dept. of Energy, Mines and Resources, Ottawa, pp. 45–48.

Table 7.—Canada: Copper smelters and refineries, 1975

Company	Plant location	Products	Annual capacity (thousand metric tons)
Canadian Copper Refineries Ltd.	Montreal East, Quebec	Electrolytic wire bars, ingot bars, ingots, cathodes, cakes, and billets.	435
		Copper sulfate	12
Falconbridge Nickel Mines Ltd.	Falconbridge, Ontario	Copper-nickel matte	[1] 590
Gaspé Copper Mines Ltd	Murdochville, Quebec	Anodes	[1] 340
Hudson Bay Mining & Smelting Co. Ltd.	Flin Flon, Manitoba	Blister	[1] 520
The International Nickel Co. of Canada Ltd.	Copper Cliff, Ontario	Blister, cathodes, wire bars, cakes, billets.	[2] 190
Noranda Mines Ltd	Noranda, Quebec	Anodes	[3] 1,540

[1] Ores and concentrates.
[2] Blister or refined.
[3] Ores, concentrate, and scrap.
Source: Department of Energy, Mines and Resources, Ottawa.

properties and prospects were tested. Mills were under renovation, modernization, and expansion. There were also a few closures due to unsatisfactory results.

In British Columbia, where most gold production is a byproduct of base metals, Dusty Mac Mines Ltd. started ore shipments from its open pit mine, south of Penticton, to the mill at Dankoe Mines Ltd. The contract was for 10,000 tons of ore per month. Development continued at the Brandywine Falls property of Northair Mines Ltd., where production was expected in 1976. Exploration increased at a number of old prospects and former producers in the Province. Small production was derived from a few placer operations.

Placer mining activity and claim-staking continued high in several districts of the Yukon and Northwest Territories. Cominco conducted a $7 million expansion at the Con mine at Yellowknife, the first gold producer in the Northwest Territories. The shaft was being sunk to 2,000 meters, and mill capacity was under expansion to 650 tons of ore per day. Most activity was in the Great Slave Lake area, where old gold prospects were staked and tested. Giant Yellowknife Gold Mines Ltd. was reassessing old mining areas, and its reserves were expanding. According to the company's annual report, its gold production was 94,437 troy ounces, a decrease from 1974, from 355,586 tons of ore averaging 0.29 troy ounce per ton. The company reported record expenditures on gold prospecting and exploration in the Northwest Territories.

The new precious metals refinery of Johnson, Matthey and Mallory Ltd. at Brampton, a suburb of Toronto, Ontario, was scheduled for completion in 1976. Planned gold capacity is 1 million troy ounces per year, expandable to 2 million troy ounces by the addition of four induction furnaces. Equipment was moved in from the old refinery, which will continue to fabricate the precious metals.

Table 8.—Canada: Precious metal smelters and refineries, 1975

Company	Plant location	Products	Annual capacity (thousand troy ounces)
Brunswick Mining & Smelting Corp. Ltd.	Belledune, New Brunswick	Silver bullion (fire-refined).	2,500
Canadian Copper Refiners Ltd.	Montreal East, Quebec	Electrolytic fine gold and silver, gold bars.	[1] 720 [2] 25,000
Cominco Ltd	Trail, British Columbia	High-purity gold and silver, silver bars.	[2] 12,000
Engelhard Industries of Canada Ltd.	Toronto, Ontario	Refined gold, silver and platinum-group metals.	NA
Handy and Harman of Canada Ltd.	do	Refined gold, silver and platinum-group metals; gold and silver sheet and wire; alloys and solders.	NA
Hudson Bay Mining and Smelting Co. Ltd.	Flin Flon, Manitoba	Gold and silver in copper anodes.	[1] 75 [2] 1,000
The International Nickel Co. of Canada Ltd.	Copper Cliff, Ontario	Fine gold and silver, platinum-group metals in concentrates.	NA
Johnson, Matthey and Mallory Ltd.	Toronto, Ontario	Refined gold, silver and platinum-group metals and alloys in various forms.	NA
Royal Canadian Mint	Ottawa, Ontario. Hull, Quebec.	Refined gold and silver; coinage.	7,000

NA Not available.
[1] Gold.
[2] Silver.

Source: Department of Energy, Mines and Resources, Ottawa.

The Royal Canadian Mint at Hull, Quebec, was making 14-karat and 22-karat gold Olympic coins. The new mint at Winnipeg, Manitoba, was in commercial operation in March and near full capacity at yearend.

Iron Ore.—Output was more than 3 million tons below that of 1974, owing to a slackening in world demand and Canada's export markets, and to labor problems at a number of iron mines. However, increased prices raised value of output by nearly $200 million. Exports totaled 36.6 million tons, slightly below those of 1974, of which 19.3 million tons went to the United States. Shipments declined to principal markets in Western Europe, the United States, and Japan. Imports nearly doubled, owing chiefly to participation of Canadian (Ontario) steel companies in new, economically attractive taconite developments in Michigan and Minnesota, Lake Superior region. Domestic consumption was estimated at 12.5 million tons, slightly below that of 1974.

The two leading producers—Iron Ore Co. of Canada Ltd. (IOC) and Quebec Cartier Mining Co. (QCM)—accounted for approximately 75% of total output. IOC alone produced in excess of 23 million wet tons in direct shipping ore and ore for concentrate and pellets at its three major facilities in Labrador and Quebec. QCM produced nearly 8 million wet tons for concentrators, close to full capacity, at Lac Jeannine, Gagnon. IOC was operating its beneficiating and pelletizing facilities at Labrador City, Labrador, near full capacity at yearend, but agglomerating problems with the pelletizing facilities at Sept-Iles, Quebec, necessitated design changes and slowed operations to above 50% of capacity for the year.

Expansion programs for mining, beneficiation, and pelletizing continued at a number of operations, although delays were caused by the weak market, labor troubles, and escalating costs. IOC expansion to 32 million tons of product per year (22 million tons of concentrate, 10 million tons of pellets) was virtually completed at Labrador City at yearend.

QCM's new mine at Mount Wright, Quebec, was in operation late in the year, and the concentrator, which will treat 135,000 tons of ore per day and produce 16 million tons of concentrate (66.5% Fe) per year, started test operations in October. The large Mount Wright ore body measures 6.4 kilometers long and 1.2 kilometers wide, and has a 75-year reserve at planned initial production rates.

In June, the Premier of Quebec announced a $500 million program for a new QCM mine at Fire Lake, redesigning of the concentrator at Lac Jeannine, Gagnon, and a new 6-million-ton-per-year pellet plant at Port Cartier on the Gulf of St. Lawrence. Participants are Sidbec-Dosco Ltd., the Provincial steel company (50.10%), British Steel Corp. (41.67%), and QCM (8.23%). There will be two separate beneficiating-pelletizing lines, each of 3-million-ton annual capacity, one producing blast furnace pellets containing 65.5% Fe and the other producing high-grade pellets containing 68% Fe for use in direct reduction to sponge iron. Ore from the Fire Lake mine will be transported 65 kilometers to the concentrator at Gagnon. The Fire Lake mine will start production at an annual rate of 1.5 million tons, which will be increased to 6 million tons as the Lac Jeannine mine is phased out.

In Ontario, the $32 million Stelco-Lurgi/Republic Steel—National Lead (SL/RN) direct reduction kiln of Steel Company of Canada Ltd. (Stelco) at the Griffith mine, near Red Lake, in the northwestern part of the Province, was completed at midyear. The kiln will convert pellets to sponge iron containing 92% Fe at a rate of 400,000 tons per year. This sponge iron will reduce dependence on scrap steel for electric furnaces at Edmonton, Alberta, and Contrecoeur, Quebec. The Algoma Steel Corp. Ltd., Algoma Ore Div., continued a $25 million deep mine development program at the MacLeod mine, near Wawa. An incline was being driven, three new levels were under development, and two 5-kilometer tunnels were underway to permit the deeper mining.

The Steep Rock Iron Mines Ltd. (SR) open pit mine at Atikokan, Ontario, was deep and costly to operate, and reserves were near depletion. Little progress was made on plans for development of SR's 600-million-ton ore body at Lake St. Joseph, 200 kilometers to the north. Negotiations continued on participation and financing. Plans called for annual capacity of 4 million tons of oxide pellets (70.5% Fe) and conversion to high-grade metal pellets for sponge iron. The Provincial Government

Table 9.—Canada: Iron ore mining and processing facilities, 1975 [1]

Province	Operating company	Location	Mill capacity (thousand metric tons)	Products	Remarks
Newfoundland (Labrador).	Iron Ore Co. of Canada Ltd.	Carol Lake, Labrador City.	127 (ore per day)	Concentrate, pellets	Open pit mine; annual capacity of 10 million tons concentrate, 9 million tons pellets.
Do	do	Schefferville (Labrador)	60 (ore per day), (including New Quebec production).	Direct shipping ore	Open pit mine; ore from five open pits shipped to Sept-Iles for shipment and pelletizing.
Do	Picklands Mather & Co.	Scully mine, Wabush	17 (concentrate per day).	Concentrate	Open pit mine; concentrate shipped to Pointe Noire for pelletizing. Seven participating companies; operating company is managing agent.
Quebec	Hilton Mines Ltd	Shawville, Bristol Township.	6.2 (ore per day)	Pellets	Open pit mine; 900,000 tons shipped annually.
Do	Iron Ore Co. of Canada Ltd.	Schefferville (Quebec)	(2)	(2)	(2).
Do	do	Sept-Iles	22 (ore per day)	Pellets	Beneficiation and pelletization of lowest direct shipping grade ores (50% Fe).
Do	Picklands Mather & Co.	Pointe Noire	17 (pellets per day)	do	Company is managing agent for a number of participating steel companies.
Do	Quebec Cartier Mining Co.	Lac Jeannine, Gagnon	8,000 (concentrate per year).	Concentrate	Open pit mine; concentrate shipped to U.S. Steel Corp. and world markets.
Do	Quebec Iron and Titanium Corp.	Lac Tio (mine), Tracy (mill and blast furnace).	630 (blast furnace per year).	Pig iron	Open pit ilmenite mine.
Ontario	The Algoma Steel Corp. Ltd.	Wawa	2,200 (sinter per year).	Sintered ore	Open pit and underground mine; siderite ore; sinter railed to Sault Ste. Marie and to Great Lakes shipment.
Do	Caland Ore Co. Ltd	Atikokan	2,300 (ore per year)	Direct shipment ore: pellets (from fines).	Open pit mine; shipments mainly to Inland Steel Co. Mine leased from Steep Rock Iron Mines Ltd.
Do	Cliffs of Canada Ltd	Adams mine, near Kirkland Lake.	1,100 (pellets per year).	Pellets	Open pit mine; magnetite ore; shipment to Dominion Foundries and Steel Ltd. (Dofasco).
Do	The International Nickel Co. of Canada Ltd.	Copper Cliff	600 (pellets per year)	do	Pyrite treated by roasting kiln reduction and atmospheric leaching.
Do	Marmoraton Mining Co.	Marmora	500 (pellets per year)	do	Open pit mine; shipment to Bethlehem Steel Corp., United States.
Do	National Steel Corp. of Canada Ltd.	Moose Mt. mine	700 (pellets per year)	do	Open pit mine; shipment to United States.
Do	Picklands Mather & Co.	Griffith mine, Bruce Lake	1,500 (pellets per year).	do	Open pit mine; shipment to Steel Co. of Canada Ltd.
Do	Sherman Mines Ltd	Temagami	1,100 (pellets per year).	do	Open pit mine; shipment to Dofasco.

Ontario	Steep Rock Iron Mines Ltd.	Steep Rock Lake, Atikokan.	640 (concentrate per year). 1,470 (pellets per year).	Concentrate, pellets	Open pit mine; shipment to The Algoma Steel Corp. and Detroit Steel Corp.
British Columbia	Texada Mines Ltd	Texada Island	400 (concentrate per year).	Magnetite concentrate	Magnetic concentration; product shipped to Japan; open pit and underground mines.
do	Westrob Mines Ltd	Queen Charlotte Islands	1,100 (concentrate per year).	do	Open pit mine; product shipped to the United States and Japan.

[1] As of Jan. 1, 1975.
[2] Part of Labrador operation.

Source: Department of Energy, Mines and Resources, Ottawa.

made plans for rail facilities, townsites, and consideration of environmental impact.

Iron and Steel.—Production and shipments of pig iron and crude steel were reduced slightly in 1975, compared with 1974, owing to the general international economic recession, to which the iron and steel industry was particularly sensitive. The relatively poor market was felt late in the year; output of ingots and castings dropped by nearly 10% during the last quarter. Domestic consumption at 10 million tons was 16% below that of 1974, the largest reduction in nearly 20 years. Exports decreased nearly 25%, reflecting sharply reduced shipments to the United States, Canada's largest export market for steel products.

Despite the unfavorable economic situation, steelmakers continued expansion programs, expecting improved conditions in 1976 and thereafter. The industry invested $680 million in capital construction and equipment in 1975, compared with $367 million in 1974.[9]

Total annual crude steel capacity, which increased from 16.6 million tons to 17.8 million tons during the year, was divided as follows at yearend: Basic oxygen furnace, 9.8 million tons; electric furnace, 4.3 million tons; and open hearth furnace, 3.7 million tons.[10]

Steel companies throughout the country were involved in modernization, expansion, and pollution abatement plans and programs. Stelco, Canada's largest in the industry, produced 4.9 million tons of crude steel in 1975, slightly below the 1974 rate, mainly because of a scheduled 2-month relining of the largest blast furnace at the Hilton Works, Hamilton, Ontario and a 6-week strike at the Edmonton Works, Alberta. Stelco continued construction on its new, fully integrated iron and steel complex at Nanticoke, on the north shore of Lake Erie, Ontario. The first stage of this project, which began in 1974, was scheduled for completion in 1978 at a cost of $900 million. Initial ingot annual capacity will be 1.2 million tons; ultimately, with a fourth stage, capacity will reach in excess of 5 million tons, probably in the late 1980's.[11]

Elsewhere in Ontario, Algoma Steel Corp. Ltd., second largest among Canadian steel producers, completed a 4,500-ton-per-day blast furnace in May and raised annual ingot capacity to 3.9 million tons as an expansion program neared completion at Saul Ste. Marie. A continuous-casting machine under construction will increase slab steel capacity to 1 million tons per year by 1978. Dominion Foundries and Steel Ltd. (Dofasco) planned to double annual ingot capacity to 5.4 million tons by 1985 at Hamilton. New basic oxygen furnace installations will raise annual capacity to 3.8 million tons by 1978. Atlas Steels Co., a division of Rio Algom Mines Ltd., the largest producer of stainless and special steels, completed two new electric furnaces at Welland. Ivaco Industries Ltd. also completed new electric furnace facilities and a continuous-casting line for billets at L'Orignal, eastern Ontario.

In Quebec, Sidbec-Dosco Ltd., the Provincial company, continued a second stage of its expansion program, which will raise ingot capacity to 1.4 million tons per year at Contrecoeur by 1977. QSP Ltd. completed a second stage involving two new electric arc furnaces, two continuous-casting machines, and a 270,000-ton-per-year rolling mill at Longeuil.

In Nova Scotia, Sydney Steel Corp. Ltd., owned by the Province, proposed a $100 million, 3-year rehabilitation program at its Sydney Works. In February, legislation was introduced to establish Cansteel Corp., another Government corporation, and an iron and steel complex on Cape Breton Island. Feasibility studies and financial arrangements were underway at yearend.

In the West, new facilities were planned, completed, or under construction by Dominion Bridge Co. Ltd., Manitoba Rolling Mills Division, Selkirk, near Winnipeg, Manitoba; Interprovincial Steel and Pipe Corp. Ltd., Regina, Saskatchewan; and Western Canada Steel Ltd., Vancouver, British Columbia, and Calgary, Alberta.

Lead and Zinc.—Demand for lead and zinc was slack in 1975, resulting in excessive stocks and mine-mill cutbacks and shutdowns. Lead production was higher than that of 1974, which was a weak year,

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[9] Western Miner. Steel-Steelmakers Expand With an Eye to the Future. V. 49, No. 6, June 1976, pp. 11–19.

[10] Lafleur, P. Iron and Steel. Canadian Mineral Survey—1975. Dept. of Energy, Mines and Resources, Ottawa, February 1976, pp. 60–62.

[11] The Northern Miner. Stelco's Lake Erie Development Will be a Model for Future Industrial Projects. Sept. 18, 1975, p. 19.

although domestic consumption at 90,000 tons was 22% below that of 1974.

Canada again was the leading world producer and supplier of zinc, accounting for 45% of world trade in zinc concentrate and 25% of the world's slab zinc supply in 1975. The principal markets were Japan, Western Europe, and the United States. There was little change in mine and smelter production from that of 1974. Zinc smelters operated at 70% of capacity for the year. Mine cutbacks were particularly sharp in the last half of the year. Consumption was on the order of 100,000 to 110,000 tons, 10% to 15% below 1974.

Base metal exploration, new mine development, and mine-concentrator expansions were widespread, involving most Provinces and the Yukon and Northwest Territories. Newfoundland Zinc Mines Ltd., a subsidiary of Teck Corp., produced the first zinc concentrate at its Daniel's Harbour property, Newfoundland, in June and made its first shipment in September. Exploration by a number of companies was heavy near Bathurst, New Brunswick, reportedly with encouraging results. Brunswick Mining and Smelting Corp. Ltd. continued a $48 million mine expansion program at Belledune Point, near Bathurst. The smelter, operated at only 64% of capacity, produced 324,247 tons of zinc concentrate and 154,843 tons of lead concentrate in 1975. In February, the company announced an arrangement with Canadian Electrolytic Zinc Ltd. for design and feasibility studies on a proposed new electrolytic zinc plant in the Province.

In Quebec, ongoing expansion of the Canadian Electrolytic Zinc refinery at Valleyfield, 55 kilometers southwest of Montreal on the St. Lawrence Seaway, was delayed by technical problems with electrical equipment, and the scheduled 1975 completion was not attained. Orchan Mines Ltd. (Noranda Mines 50.8%) completed shaft sinking to 480 meters at its mine in the Mattagami area, northwestern Quebec. Lemoine Mines Ltd., an operating company for Patino Mines (Quebec) Ltd., continued development of a high-grade zinc ore body in the Chibougamau area.

Texasgulf Canada continued an expansion program, which will increase mine capacity from 3.2 million tons to 4.5 million ton of ore per year at Kidd Creek, near Timmins, Ontario. A new 1,600-meter shaft was down to 600 meters at yearend. The Hoyle zinc refinery was operated below capacity for the year, and planned expansion was deferred. Delays in mine development were also encountered at the Sturgeon Lake property of Mattagami Lake Mines.

Hudson Bay Mining & Smelting Co. Ltd., which was conducting a modernization and environmental improvement plan at the smelter-refinery at Flin Flon, on the Manitoba-Saskatchewan border, curtailed copper-zinc production, particularly during the last half of the year.

Cominco Ltd. operations were normal at the Sullivan and H.B. mines, but the Trail smelter-refinery in British Columbia worked below rated capacity. At Trail, operations were at 60% of capacity for the last half of the year.

In the Yukon Territory and parts of the Northwest Territories, base metal exploration was widespread, and potential was good for future production. Regional prospecting and exploration had been at a high level since 1973, and exploration, including drilling, was underway in a number of areas in 1975.[12]

In the Yukon, lead and zinc accounted for 66% of total value of mineral production in 1975. Cyprus Anvil Mining Corp. Ltd., a major producer, sold 120,176 tons of lead concentrate and 115,155 tons of zinc concentrate from its mine near Faro in 1975, 37% and 46%, respectively, over that of 1974, according to the company's annual report. A feasibility study for a lead-zinc smelter in the Yukon, based on a Cyprus Anvil-Canadian Government agreement, was negative because of high power and transportation costs and distance from potential markets. Kerr Addison Mines Ltd.-AEX Minerals Corp. Ltd. were conducting exploration and adding to reserves at the Grum deposit, also in the Faro area.

Mining development continued on schedule at the property of Nanisivik Mines Ltd. in the Strathcona Sound area, northwestern Baffin Island, where construction started in April 1974. Interests were held by Mineral Resources International Ltd. (59.5%), the Canadian Government (18%), Metallgesellschaft AG (11.25%), and Billiton N.V. (11.25%). Progress was made in re-

[12] Brock, J. S. Selwyn-Mackenzie Zinc-Lead Province, Yukon and Northwest Territories. Western Miner. V. 49, No. 3, March 1976, pp. 9–16.

solving many difficulties encountered in construction in the High Arctic. Early in the year, more than 1,800 meters of underground development work had been completed, and, late in the year, the concentrator building was closed in, permitting inside construction work to continue during the winter months.[13]

Canex Placer Ltd. continued drilling at a large low-grade deposit in the Summit Lake area, Howard's Pass, near the Yukon-Northwest Territories border. Texasgulf Inc. established ore reserves of 7 million tons at 14.8% zinc at its Izok Lake property, 360 kilometers north of Yellowknife, Mackenzie District. Arvik Mines Ltd. (Cominco Ltd. 75%) postponed a decision on development of the high-grade Polaris deposit, Little Cornwallis Island, following a mine feasibility study.

Nickel.—Reduced output, compared with that of 1974, was mainly due to labor strikes and/or operational cutbacks by the two major producers—INCO and Falconbridge Nickel Mines—in the Sudbury District, Ontario. The latter's output was hit particularly hard by a strike lasting some 2½ months from August to November, followed by a 30% cutback in smelter operation.[14]

Total nickel deliveries were 30% lower, and domestic consumption nearly 25% lower, during a period of weak demand and rising operating costs. According to the companies' annual reports, INCO nickel output of about 209,000 tons was down 10% from that of 1974, and Falconbridge deliveries at 28,000 tons were down 31%. INCO announced plans for a new rolling mill for nickel and cupreous-nickel alloy strip at Sudbury, with construction to start in 1976. Falconbridge continued development at the new Lockerby mine, 32 kilometers south of Sudbury, where full production was scheduled for 1977.

Sherritt Gordon Mines Ltd. curtailed operations at Lynn Lake, Manitoba, because of labor shortages, and turned the mining operation over to a contractor in September. The company's refinery at Fort Saskatchewan, Alberta, was closed for 6 weeks during the summer.

Platinum-Group Metals.—Platinum-group metals output was higher in quantity than in 1974, but value increased little because of soft prices prevailing during the year. The major producers, INCO and Falconbridge, which process platinum-bearing nickel-copper ores at their smelters in Ontario and Manitoba, also processed similar ores from other operations, chiefly Noranda Mines at the Langmuir mine, near Timmins, Ontario, and Dumbarton Mines Ltd. at Bird River, Manitoba.

Texasgulf Canada took an 18-month, renewable option from Boston Bay Mines Ltd. on the Lac des Isles property, 80 kilometers north of Thunder Bay, Ontario. In August, Texasgulf was drilling to depths of 150 meters. Average grade appeared to be 0.10 to 0.15 troy ounce of platinum and palladium per ton in nickel-copper ores.

Silver.—Output was lower in 1975 than in 1974 corresponding to reductions in base metal operations, where silver is a byproduct or coproduct.

Expansions underway at a number of base metal mines will influence future silver production. Brunswick Mining and Smelting was expected to add up to 1 million troy ounces of silver output near Bathurst, New Brunswick, by 1979. In Quebec, two new base metal-silver mines went into production in 1975, and exploration drilling by Selco Mining Corp. Ltd.–Pickands Mather & Co. in Brouillan Township, northwestern Quebec, indicated silver content in excess of 1 troy ounce per ton in copper-zinc ore.

In Ontario, which again led other Provinces as a silver producer, accounting for 37% of total Canadian output, the new Texasgulf refinery complex at Kidd Creek, near Timmins, includes a silver refinery expected to produce 10 million to 12 million ounces per year by 1980. Texasgulf production of silver-in-concentrate was 9,235,000 troy ounces compared with 10,553,000 troy ounces in 1974, according to the company's annual report. Construction continued on a new hydrometallurgical plant of Canadian Smelting and Refining Ltd., the operating company for the joint venture of Péchiney Ugine Kuhlman of Paris, France, and St. Joseph Explorations Ltd. (subsidiary of St. Joe Minerals Corp., U.S.) in the Cobalt area. This refinery will be capable of processing low-grade and various secondary materials at a rate of 6 million

[13] Agar, C. F. Nanisivik Mines—Good Progress Toward Production in 1976. Western Miner. V 49, No. 4, April 1976, pp. 64–65.

[14] The Northern Miner. Falconbridge Cuts Back on Production. V. 61, No. 35, Nov. 13, 1976, p. 20.

troy ounces of silver per year, starting in 1976.

Near Flin Flon, Manitoba, the new Centennial and Westarm base metal ore bodies under exploration and development by Hudson Bay Mining & Smelting also contain silver. In British Columbia, several silver-bearing base metal and precious metal deposits were under exploration and development.

Cyprus Anvil Mining Corp. Ltd. and United Keno Hill Mines Ltd. were the leading silver producers in the Territories, where the high level of successful base metal and precious metal exploration indicated new silver resources. At United Keno, which operated several mines 45 kilometers north of Mayo, Yukon Territory, silver values were as high as 44 troy ounces per ton in proven reserves. Reduced activity of Echo Bay Mines Ltd. near Port Radium, at the eastern end of Great Bear Lake, Mackenzie District, Northwest Territories, was a significant factor in lower national silver output in 1975. Base metal ores at the new mines of Nanisivik Mines Ltd. on Baffin Island and Texasgulf Inc. near Izok Lake, north of Yellowknife, contain about 1.8 troy ounces silver per ton, and Kerr Addison Mines Ltd.'s Grum deposit, near Faro, Yukon Territory, contains about 2 troy ounces per ton.

Silver capacity at the new precious metals refinery of Johnson, Matthey and Mallory Ltd. at Brampton, Toronto area, will be 5 million troy ounces per year, mainly from scrap materials. The coinage facilities of the Royal Canadian Mint at Hull, Quebec, completed a third and fourth series and was working on a fifth series of silver Olympic coins. The overall program of seven series, to be completed in 1976, may require a total of 35 million troy ounces of silver.

Other Metals.—Consolidated Durham Mines and Resources Ltd. increased production of antimony concentrate (66% Sb), and a diamond drilling program was increasing reserves at the Lake George mine, New Brunswick. Bismuth and cadmium production, both byproduucts of base metals mining, was lower than that of 1974. Cobalt mine output also was reduced, corresponding to the drop in nickel output, of which cobalt is a major byproduct.

Demand for columbium was strong, and expansion was underway at St. Lawrence Columbium and Metals Corp. Ltd.'s (SLC) mine and mill near Oka, Quebec. SLC was expanding annual capacity from 2,500 tons to 3,600 tons and planned to produce ferrocolumbium in 1976. A new producer, Niobec Inc., will make a columbium concentrate (60% Cb, 2,500 tons per year) at its new mine and mill at St. Honore, Quebec.

Cominco, the only mercury producer in 1975, closed the Pinchi Lake mine, near Fort St. James, British Columbia, owing to rising operating costs, oversupply, and soft prices for mercury.

Molybdenum production and demand were lower than those of 1974; shipments of oxides, sulfides, and ferromolybdenum were down 11%. Canex Placer, Endako Div., British Columbia, accounted for about one-half the 1975 output; the other one-half was a byproduct of certain copper mining operations. There was minor exploration activity for molybdenum in British Columbia and the Northwest Territories.

Seuddeutsche Kalkstickstoff Werke of West Germany scheduled completion of its silicon and ferrosilicon plant at Becancour, Quebec, for 1976. Annual capacity will be 23,000 tons, each, for silicon and ferrosilicon.

Tantalum Mining Corp. of Canada Ltd. (Tanco), the only tantalum producer in Canada, shipped about 200 tons Ta_2O_5-in-concentrates from the Bernic Lake mine and mill, Manitoba. A new mill section, added to recover fine tantalum in slimes, will improve overall recovery from 60% to 75% and permit mining of lower grade ores.

Demand was high for titania slag, which was environmentally more acceptable for processing than ilmenite ores for pigments. Quebec Iron and Titanium Corp. Ltd. (QTT) production of titania slag at Sorel, Quebec, was down from that of 1974, but sales value was up 20%. About 90% of this slag was exported; the remaining 10% went to two pigment manufacturers in Canada, Canadian Titanium Pigments Ltd. at Varennes, Quebec, and Tioxide of Canada Ltd. at Tracy, Quebec. Both companies expanded capacity in 1975.

Canada Tungsten Mining Corp. Ltd., Canada's only tungsten producer in 1975, went from open pit to underground operations and increased capacity to about 1,800 tons per year at its mine at Tungsten, Northwest Territories, near the Yukon border. A high talc content in the ore caused milling problems, necessitating modification to the mill circuit. Brunswick Tin Mines Ltd. conducted pilot plant tests on a tungsten-molybdenum-bismuth ore at Mount Pleasant, New Brunswick. Amax Exploration Inc. was studying a tungsten deposit at Mac Tung, Northwest Territories. Canadian consumption of tungsten in metal, powder, chemicals and ferrotungsten was estimated at 1,100,000 tons, about 13% below that of 1974.

Demand for zirconium was mainly for use in fuel sheathing for nuclear reactors. There was no domestic production of zirconium in 1975, and supply was provided by imports of zirconium alloys. Norco Industries Ltd. was building a tube mill at Arnprior, Ontario, for use in nuclear reactor components and other products.

NONMETALS

Asbestos.—The Canadian asbestos market was strong, and prices remained firm and rising in 1975. Asbestos was in tight supply, and available supplies were allocated owing to a series of events that caused shortages and reduced shipments to about 65% of the 1974 rate. A fire in December 1974 destroyed Asbestos Corp. Ltd's King Beaver mill, Thetford, Quebec. A feasibility study will determine whether the mill will be rebuilt at an estimated cost of $60 million to $100 million. A 7-month strike affected most mines in the Thetford-Black Lake area, Quebec. A major landslide involving a high-grade section of the open pit of Canadian Johns-Manville Co. Ltd. at Jeffrey, Quebec, Canada's leading asbestos producer, caused a major disruption of operations.[15]

Cassiar Asbestos Corp. Ltd. placed its new primary concentrator and aerial tramline in operation, improving the output rate late in the year at the Cassiar mine, northern British Columbia. Feasibility studies on the property of Abitibi Asbestos Mining Co. Ltd., a subsidiary of Brinco Ltd., 80 kilometers north of Amos, Quebec, indicated possible commercial development by 1978–79. The United Asbestos Inc. new mine, near Timmins, Ontario, started operating on a tune-up basis during the year. Canadian Johns-Manville closed the Reeves mine, also near Timmins, in February because of difficulty in meeting new fiber emission standards.

A new slurry explosive was developed for use in permafrost at the open pit of Asbestos Corp., Asbestos Hill, Ungava Peninsula, in extreme northern Quebec, near Hudson Strait.[16]

Barite.—Production was higher than that of 1974. Producers were Dresser Minerals Ltd., Walton, Nova Scotia, which recovered lump and ground barite from ore stockpiles and a quarry, and ore from the

[15] Vance, A. G. Asbestos Industry Suffers Through Troubled Year. The Northern Miner, Annual Review Number, v. 61, No. 37, sec. B, Nov. 27, 1975, pp. B12–B13, B26.

[16] Lang, L. C. New Permafrost Blasting Method Developed at Asbestos Hill. Can. Min. J., v. 97, No. 3, March 1976, pp. 48–53.

Table 10.—Canada: Asbestos producers, 1975

Province or Territory	Company	Mine and location	Milling capacity (metric tons of ore per day)
Newfoundland	Advocate Mines Ltd	Baie Verte	6,800
Quebec	Canadian Johns-Manville Co. Ltd.	Jeffrey, Asbestos	30,000
Do	Asbestos Corp. Ltd	Asbestos Hill, Putuniq	5,400
Do	do	British Canadian, Black Lake.	11,200
Do	do	Normandie, Black Lake	6,800
Do	Lake Asbestos of Quebec Ltd	Black Lake	8,200
Do	do	Thetford	3,200
Do	Carey-Canadian Mines Ltd	East Broughton	5,000
Do	Bell Asbestos Mines Ltd	Thetford	2,700
Ontario	United Asbestos Inc	Matachewan	3,600
Do	Hedman Mines Ltd	Matheson	270
British Columbia	Cassiar Asbestos Corp Ltd	Cassiar	3,000
Yukon Territory	do	Clinton Creek	3,600

Source: Department of Energy, Mines and Resources, Ottawa.

upper levels of a flooded mine; Baroid of Canada Ltd., which operated mining and milling facilities at Onoway, Alberta, and tabling facilities for lead-zinc tailings at Spillimacheen, British Columbia; and Mountain Minerals Ltd., with grinding and sizing facilities at Lethbridge, Alberta, and ores and tailings from Parson, Brisco, and Invermere, in British Columbia.

Welcome North Mines Ltd. reported mapping and sampling a barite deposit, 90 meters thick, in the Selwyn Basin, east of Ross River, Yukon.

Cement.—The slight decrease in cement output was attributed primarily to a reduced growth rate in the construction industry in Canada and the United States. Cement capacity, by Province, at yearend, including three grinding plants, was as follows, in thousand tons per year:

Province	Number of plants	Capacity
Newfoundland	1	159
Nova Scotia	1	238
New Brunswick	1	408
Quebec	7	4,742
Ontario	7	5,364
Manitoba	2	889
Saskatchewan	2	206
Alberta	3	1,017
British Columbia	4	1,381
Total	28	14,404

About 37% of this capacity existed in Ontario, 33% in Quebec, 24% in the western Provinces, and 6% in the Atlantic Provinces. With ongoing expansions, theoretical capacity had increased to 15,800,000 tons at yearend. Canada Cement Lafarge Ltd. added 450,000 tons to its annual capacity with a new kiln at St. Constant, south of Montreal, Quebec, and 180,000 tons with a major modernization program at Exshaw, Alberta. Lake Ontario Cement Ltd. added 770,000 tons per year capacity with a fourth kiln at Picton, Ontario. At yearend, modernizations and/or expansions were underway by Canada Cement Lafarge at Montreal East, Quebec, and at Brookfield, Nova Scotia; and by St. Marys Cement Ltd. at St. Marys, Ontario. A new plant, which will add capacity of 1 million tons per year, was under construction by Ocean Cement Ltd. in the Vancouver area, British Columbia.

Diamond.—Not found commercially in Canada, diamonds attracted attention to the central Arctic Islands, Northwest Territories. Kimberlite bodies were discovered during regional geological mapping, and Cominco Ltd. and Diapros Ltd. investigated these bodies for diamonds. A bulk sampling plant was in operation on Somerset Island for heavy mineral concentrates, which have been shipped to the Republic of South Africa for testing.[17]

Fluorspar.—Production at Alcan's fluorspar works, near St. Lawrence, Newfoundland, was only about 40% of that of 1974, because of a 7-month strike that continued to yearend. A concentrate (70% CaF_2) was produced by heavy media separation and shipped to Alcan's aluminum smelter at Arvida, Quebec, for use in making aluminum fluoride. The future of the St. Lawrence operations, including a new deposit under development to a depth of 450 meters, was uncertain pending strike settlement.

Gypsum.—Lower production in 1975 was attributed to a slacking of growth in the construction industry in Canada and the recession in the construction industry in the United States, which had received a large portion of the output from the Atlantic Provinces. Of 13 operating properties, 5 quarries in Nova Scotia accounted for nearly three-fourths of total output. West-

[17] Podgham, W. A. Northern Exploration—NWT 1975, An Exploration Review. Western Miner. V. 48, No. 10, October 1975, p. 14.

Table 11.—Canada: Shipments of construction materials, 1975 [p]

(Thousand metric tons and thousand dollars)

Commodity	Quantity	Value
Cement	9,764	265,283
Clays and clay products	NA	69,958
Gypsum	5,674	19,720
Lime	1,714	40,439
Sand and gravel	204,079	260,340
Stone	88,087	170,700
Total	NA	826,440

[p] Preliminary. NA Not available.

Source: Statistics Canada.

roc Industries' Silver Plains mine, south of Winnipeg, Manitoba, became inactive owing to flooding by artesian water.

There were 19 gypsum product manufacturing plants operating in 1975, including 4 in Quebec and 3 in Ontario which receive raw materials from the Atlantic Provinces, and 9 in the western Provinces.

Lime.—Despite reduced output in 1975, expansions were planned in Ontario and Quebec, which together accounted for about 85% of total output. According to EMR, 18 companies operated 85 kilns at 24 lime plants throughout Canada in early 1975. Operations apparently were at about 75% of capacity, which was about 2.3 million tons in 1975.

Mica.—A joint venture of Le Société Mineralurgique Laviolette, Montreal, and Marietta Resources International Inc., a U.S.-based company, announced plans to develop a mica deposit at Lake Letondal, near Parent, Quebec. The ore, containing 90% mica, will be shipped to a new processing plant, under construction at Boucherville, near Montreal, for production of mica flake at an initial rate of 10,000 tons per year.[18]

Nepheline Syenite.—Output was down about 16%, compared with that of 1974, at Blue Mountain, 40 kilometers northeast of Peterborough, Ontario. Producers were Indusmin Ltd., which operated a 1,000-ton-per-day mill for eight product grades at Nephton, Ontario, and Sobin Chemicals (Canada) Ltd., a subsidiary of International Minerals and Chemicals Corp. (Canada) Ltd. (IMC), with an 800-ton-per-day mill for three product grades at Havelock, Ontario. Indusmin installed new mill facilities to increase capacity for the finely ground grades. Equipment for environmental improvement was installed at both mills.

Fertilizer Materials.—*Phosphate.*—There was no phosphate rock production in Canada, which imported its supply largely from the United States. Erco Industries Ltd. produced elemental phosphorus at an annual rate of 90,000 tons at plants at Varennes, Quebec, and Long Harbour, Newfoundland. Thirteen plants manufactured phosphate fertilizers throughout Canada; total annual capacity was about 1 million tons.

IMC announced an extensive exploration project underway in the Kapuskasing District, northern Ontario, where about 15,000 meters of drilling indicated a major orebody. Drilling continued at yearend. IMC planned trenching and exploratory shaft-sinking. Overburden was 9 to 60 meters thick.[19]

Potash.—Canada accounted for 23% of the total world potash output in 1975. About 70% of this supply went to U.S. markets, 25% overseas, and 5% to domestic markets. Lower output and shipments in 1975 were attributed to labor strikes affecting three operations (Duval Corp. of Canada Ltd., Potash Corp. of America Inc. (PCA), and APM Operators Ltd.) and to a fire in July at Hudson Bay Mining & Smelting's mine at Rocanville, Saskatchewan, which lost about 3 months production. Inventories held at yearend totaled about 1 million tons K_2O equivalent.

[18] The Northern Miner. New Mica Industry is Being Born in Quebec. V. 61, No. 36, Nov. 20, 1976, p. 1.

[19] The Northern Miner. IMC's Ontario Phosphate Discovery Looks Big. V. 61, No. 43, Jan. 8, 1976, p. 1.

Table 12.—Canada: Producers of gypsum, 1975

Province	Company	Mine location
Newfoundland	The Flintkote Co. of Canada Ltd	Flat Bay.
Nova Scotia	Little Narrows Gypsum Co. Ltd	Little Narrows.
Do	Georgia-Pacific Corp., Bestwall Gypsum Div	River Denys.
Do	Fundy Gypsum Co. Ltd	Wentworth and Miller Creek.
Do	National Gypsum (Canada) Ltd	Milford.
Do	Domtar Construction Materials Ltd	MacKay.
New Brunswick	Canadian Gypsum Co. Ltd	Hillsborough.
Do	Canada Cement Lafarge Ltd	Havelock.
Ontario	Canadian Gypsum Co. Ltd	Hagersville.
Do	Domtar Construction Materials Ltd	Caledonia.
Manitoba	Westroc Industries Ltd	Silver Plains.
Do	Domtar Construction Materials Ltd	Gypsumville.
British Columbia	Western Gypsum Ltd	Windermere.

Source: Department of Energy, Mines and Resources, Ottawa.

The confrontation between the Saskatchewan Provincial Government authorities and the potash industry over expansion desired by the Government and excessive taxation claimed by the industry resulted in a number of court actions during the year and the announcement, in November, of provincial plans to purchase or expropriate a controlling interest in the industry.

In February the Saskatchewan Government established the Potash Corp. of Saskatchewan (PCS), a Provincial Crown company. PCS planned to establish new mines on a full ownership or joint venture basis.

Following imposition of a reserve tax late in 1974, the Canadian Potash Producers Association (CPPA) claimed that a tax burden of 87.6% of pretax profit (based on 1975 production and a \$60 per ton K_2O selling price) left insufficient capital for investment in new production capacity. The industry also challenged the constitutionality of the reserve tax and, in a separate action, sought to pay this tax under a court order providing for return of these tax funds with interest, if this tax were declared unconstitutional. This was denied by the courts, but the decision was appealed by the industry.

In May the courts had ruled a prorationing fee unconstitutional and awarded compensation to Central Canadian Potash Co. Ltd. The decision was appealed by the Provincial Government. In October, the industry again brought suit against the Provincial Government for return of fees, totaling \$24 million, already paid.

On November 12 the Premier of Saskatchewan announced in a Throne Speech that he would seek legislation enabling the Government to purchase or expropriate some or all potash mines in the Province. If agreement could not be reached on sale terms, expropriation would be considered. The Government's announced goal was public ownership of at least one-half of total potash capacity. Of 14 companies with interests in the industry, 7 were U.S.-owned. The Potash Development Act of 1975, introduced into the Provincial legislature, provided for this purchase or expropriation. Interests were to be purchased on a selective basis, determined by potential for expansion, efficiency of operations, and ore quality. At yearend, all companies had met with Government authorities, and further meetings were planned.

In New Brunswick, PCA planned further exploration at its Sussex property, and IMC received a letter of intent from the Government for rights to exploration and development work at Salt Springs, south of the PCA property.

Salt.—Production losses in 1975 were due to strikes, principally at Canadian Salt Co. Ltd., Windsor, Ontario (7½ months); Domtar Chemicals Ltd., Goderich, Ontario, where a strike started in May and had not been settled at yearend; and Domtar's operation at Unity, Saskatchewan (4 months). Needed supplies were obtained from stockpiles and outside purchases.

Rock salt from bedded deposits in southwestern Ontario and Nova Scotia were the principal sources. Byproduct salt from potash mines was reserved for road use. Potash deposits being explored by PCA and IMC in New Brunswick were associated with salt.

Silica (Quartz).—Ten operations, including four in Quebec, produced silica throughout Canada, principally for use as a metallurgical flux in copper-nickel

Table 13.—Canada: Potash producers, Saskatchewan Province, 1975

Operating company	Mine location	Capacity (thousand metric tons) KCl	Capacity (thousand metric tons) K_2O equivalent
Alwinsal Potash of Canada Ltd	Lanigan	900	540
APM Operators Ltd	Allan	1,360	830
Central Canada Potash Co. Ltd	Colonsay	1,360	820
Cominco Ltd	Vanscoy	1,090	650
Duval Corp. of Canada Ltd	Saskatoon	1,090	660
Hudson Bay Mining & Smelting Co. Ltd	Rocanville	1,090	660
International Minerals and Chemical Corp. (Canada Ltd. (IMC)	Esterhazy	1,900	1,160
Do	do	1,560	950
Kalium Chemicals Ltd	Belle Plaine	1,360	850
Potash Corp. of America, Inc. (PCA)	Saskatoon	690	420
Total		12,400	7,540

Source: Department of Mineral Resources, Saskatchewan.

Table 14.—Canada: Salt producers, 1975

Province	Company	Mine or plant location	Operation
Nova Scotia	The Canadian Rock Salt Co. Ltd.	Pugwash	Mining at depths of 190 meters and 250 meters; fines for vacuum pan evaporation.
Do	Domtar Chemicals Ltd	Amherst	Brining for vacuum pan evaporation.
Ontario	Allied Chemical Canada Ltd.	Amherstburg	Brining for soda ash.
Do	The Canadian Rock Salt Co. Ltd.	Ojibway	Mining at depths of 290 meters.
Do	The Canadian Salt Co. Ltd.	Windsor	Brining, vacuum pan evaporation, fusion.
Do	The Dow Chemical Co. of Canada Ltd.	Sarnia	Brining for chemicals.
Do	Domtar Chemicals Ltd	Goderich	Mining at depth of 530 meters; brines for vacuum pan evaporation.
Manitoba	Dryden Chemicals Ltd	Brandon	Natural brines for chemicals.
Saskatchewan	Northern Industrial Chemicals Ltd.	Saskatoon	Brining for chemicals.
Do	Domtar Chemicals Ltd	Unity	Brining, vacuum pan evaporation, fusion.
Do	The Dow Chemical Co. of Canada Ltd.	Fort Saskatchewan.	Brining for chemicals.
Do	The Canadian Salt Co. Ltd.	Belle Plaine	Fine salt byproduct of potash.
Alberta	do	Lindbergh	Brining, vacuum pan evaporation, fusion.

Source: Department of Energy, Mines and Resources, Ottawa.

smelters and also for glass, ceramics, silicon and ferrosilicon. Output was lower than that of 1974, owing to continuing problems with the crushing, grinding, and classification circuits at the Midland, Ontario, mill of Indusmin Ltd., the principal producer. Indusmin has capacity for 900,000 tons of lump silica and fines per year at the Badgeley Island quarry, Georgian Bay, and 450,000 tons of products per year at the Midland mill, Ontario. The company also operated a mine and mill near Saint-Canut, Quebec.

Sulfur.—Production from 45 sour natural gas processing plants, 42 of which were in Alberta, continued a decline following a record high reached in 1973. Production had increased steadily from initial production in 1951 to 1973, and was expected to continue downward unless major new sour wet gas discoveries are made. Although production volume was lower, total sales value from all sources increased from $78.4 million in 1974 to $99.6 million (preliminary) in 1975.

According to the Energy Resources Conservation Board (ERCB), stockpiles in Alberta totaled 16 million tons at yearend, which resulted from involuntary production from natural gas exceeding sales volume. Canadian sulfur exports declined 22% from the 1974 total. Nevertheless, Canada continued to be the world's largest exporter of sulfur. Sulfur production capacity was 26,000 tons per day and 8 million tons per year.

In addition to production from sour natural gas, sulfur was also recovered from crude oil, the Athabasca bituminous sands, smelter gases (in the form of sulfuric acid), and pyrite concentrates (for sulfuric acid). Most natural gasfields contained 1% to 20% H_2S. Elemental sulfur from the hydrocarbon sources accounted for about 86% of total output, and the smelter gas source provided for the remainder (704,000 tons sulfur in sulfuric acid); pyrite was not used, producers having converted to elemental sulfur for use in sulfuric acid.

New transport and handling facilities were being installed. New liquid tank and gondola rail cars were ordered. Shell Canada Ltd., a leading producer, was installing new stockpile, loading and hauling facilities and was overhauling its sulfur slating system at the Waterton plant, Alberta. Storage capacity was also increased at Vancouver, British Columbia, so that 4 million tons per year could be moved at this port. Aquitaine Co. of Canada Ltd. also added extensive new handling, transport, and slating facilities at Ram River, Alberta.

The Alberta ERCB reported changes in yearend 1974 and 1975 proved Provincial sulfur reserves from natural gas as follows (in million tons):[20]

Dec. 31, 1974	170.3
Change 1975	−15.1
Production 1975	−6.5
Dec. 31, 1975	148.7

Proved sulfur reserves in the Athabasca bituminous sands, based on 7 long tons of sulfur per thousand barrels in reserves of recoverable synthetic crude oil, were 189 million tons. Ultimate reserves from natural gas, based on 2.7 long tons of sulfur per million cubic feet of marketable gas, were 305 million tons, and ultimate recoverable sulfur reserves from the tar sands totaled nearly 1.8 billion tons.

MINERAL FUELS

Coal and Coke.—Coal production was higher than that of 1974. There were few disruptions to operations, most mines operated at or near capacity, and new capacity became available. Value of output nearly doubled, reaching $590 million, owing to substantial price increases during the year. The average minesite price for all grades of coal increased 66% to $21.33 per short ton in 1975. A total of 31 operators reported production, 85% of which was from open pit mines and the remainder from underground mines. Twelve major producers accounted for 87% of total output. Alberta was the leading Province in coal output, accounting for 40%, followed by British Columbia 38%, Saskatchewan 14%, Nova Scotia 6%, and New Brunswick 2%.

Consumption in thermal powerplants totaled about 16.6 million tons, and 7.4 million tons of coking coal was used in producing 5.3 million tons of coke. Demand for both coking and steam coal dropped off in the latter part of the year.

[20] Energy Resources Conservation Board. Reserves of Crude Oil, Gas, Natural Gas Liquids, and Sulfur. ERCB-76-18, Calgary, Alberta, Dec. 31, 1975, pp. 8-1—8-6.

Table 15.—Canada: Principal coal mines, 1975[1]

Province	Company	Mine and location	Production [e] (thousand tons)	Remarks
Nova Scotia	Cape Breton Development Corp. Ltd.	Lingan mine, Lingan	1,004	Underground mine; coal for power generation.
Saskatchewan	Manitoba and Saskatchewan Coal Co. Ltd.	Boundary Dam mine, Estevan.	1,472	Open pit; lignite for power generation.
Do	Utility Coals Ltd	Utility mine, Estevan.	954	Do.
Alberta	Forestburg Collieries Ltd.	Diplomat mine, Forestburg.	1,002	Open pit; coal for power generation, domestic, and industrial uses.
Do	Manalta Coal Ltd	Whitewood mine, Wabaman.	2,275	Open pit; coal for power generation.
Do	do	Highvale mine, Sundance.	1,844	Do.
Do	Coleman Collieries Ltd	Tent Mountain mine, Coleman.	964	Open pit; coking coal for export to Japan.
Do	Cardinal River Coals Ltd.	Cardinal River mine, Luscar.	2,016	Do.
Do	McIntyre Mines Ltd	Smoky River mines, Grand Cache.	2,645	Open pit and underground; coking coal for export to Japan.
British Columbia	Kaiser Resources Ltd	Michel Colliery, Natal.	1,089	Underground, hydraulic mining; coking coal for export to Japan.
Do	do	Balmer, Sparwood	6,594	Open pit and underground; leading producer in country; coking coal for export to Japan.
Do	Fording Coal Ltd	Fording mine, Fording Valley.	4,350	Open pit; ranks second as producer; coking coal for export to Japan.

[e] Estimate.
[1] Those producing more than 1 million short tons (approximately 900,000 metric tons) for the year.

Source: Department of Energy, Mines and Resources, Ottawa.

Coal exports, principally coking coal from British Columbia and Alberta, increased 7.7% compared with those of 1974. The average coking coal export price to Japan was about $50 per ton f.o.b., Vancouver, B.C., about 60% above 1974 prices.

Table 16.—Canada: Coal trade, 1975

(Thousand metric tons and thousand dollars)

Country	Quantity	Value
Exports:		
Japan	10,765	455,001
United Kingdom	323	10,157
France	267	4,624
Denmark	137	2,519
United States	111	3,582
West Germany	92	1,989
Other	(1)	28
Total	11,695	477,900
Imports (for consumption):		
United States	15,221	572,624
Poland	31	1,997
United Kingdom	3	192
Other	(1)	3
Total	15,255	574,816

1 Less than ½ unit.

Source: Statistics Canada.

Imports, principally from the United States for Ontario Hydro Power Ltd. and the iron and steel industry in Ontario, were higher by 2.6 million tons as these consuming industries were rebuilding stocks following reduced deliveries in 1974. Coking coal was delivered to three iron and steel companies having coke ovens in Hamilton and Sault Ste. Marie, Ontario, and to Sydney Steel Corp. in Nova Scotia, which blends U.S. and Canadian coals for coking purposes.

The proposed program, supported by the Federal Government, to bring Western steam and coking coals to the East, principally for use by Ontario Hydro and the iron and steel industry in Ontario, was behind schedule mainly because of a moratorium on new coal mine development in Alberta, pending a new Provincial coal policy. The project was designed to provide for increasing demand, estimated at 10 million tons by 1980, thereby avoiding greater dependence on U.S. sources. Canadian National Railways, Canadian Pacific Railroads, and Neptune Coal Terminal Co. were planning infrastructure and rail capacity expansions. Negotiations were underway to establish a major terminal at Thunder Bay, Ontario.

New coal development in Alberta and British Columbia was dependent on new Provincial coal policy. In Alberta, exploration and development were limited by a moratorium on new coal mine development. In midyear, a new land-use program was announced for the eastern slope of the Rocky Mountains. The foothills and mountain regions were particularly sensitive to land-use and environmental policy. Coal resources of the mountain, foothills, and plains regions were under assessment. Production permits were awaited in connection with plans for shipping to the eastern Canadian market.[21]

Late in the year, the Minister of Mines of British Columbia proposed a $1 billion Provincial-Federal-industry cost-sharing program to develop coal reserves in the northeastern part of British Columbia.[22] Engineering and feasibility studies were to be conducted on the Sukunka, Wolverine, and Babcock properties, and new roads, rail lines, bulk-loading terminals, and other infrastructure were planned.

Because of growing demand for coking coal and increasing dependence in U.S. supply, the coking coals of both eastern

[21] Chesney, J. H. Coal Developments in Alberta Await Word on Government Policy. The Northern Miner, v. 61, No. 51, Mar. 4, 1976, pp. B1, B9.

[22] The Northern Miner. B.C. Announces $1 Billion Plan for Coal Mines. V. 61, No. 38, Dec. 4, 1975, pp. 1, 8.

Table 17.—Canada: Coke production and trade

(Thousand metric tons)

	Production		Exports		Imports	
	Coal coke	Petroleum coke	Coal coke	Petroleum coke	Coal coke	Petroleum coke
1974	5,450	274	261	25	509	746
1975 p	5,279	271	96	162	546	573

p Preliminary.

Source: Statistics Canada.

and western Canada assumed greater importance.[23] The high-volatility eastern coals, which would be blended with western coals, were of interest because of a proposed new iron and steel complex in Nova Scotia. The western coals are largely low-sulfur, moderate high-ash, and low- to medium-volatility.

Following a Kaiser Resources Ltd.-Mitsui Mining & Smelting Co. Ltd.-v/o Licensintorg (U.S.S.R.) cooperative agreement in 1974, Kaiser was mining a coal seam, 16 meters thick, at the Sparwood Mine, British Columbia, by hydraulic mining methods. Higher water pressures and volumes improved efficiency, and recovery increased from 10%–12% to 70%. Mining above the valley floor permitted coal slurry transport by gravity to a dewatering plant. Sublease agreements were made with Fording Coal Ltd. and Quintette Coal Ltd. for use of new hydraulic mining technology at other mines in British Columbia.[24]

Natural Gas.—Both gross and marketable production were similar to 1974 rates. According to the Canadian Gas Association (CGA), revenues from industrial, commercial, and residential use totaled $1,307 million, up $327 million from 1974, because of price increases during the year.[25] Actual consumption was only marginally different from 1974, owing to conservation practices, the economic slowdown, and higher prices. Exports to the United States continued a gradual downward trend, but CGA reported revenues from these exports increasing from $503 million in 1974 to $1,166 million in 1975.

No major gas discoveries were reported in 1975. Some success was achieved in the shallow gasfields in southern Alberta and southwest Saskatchewan, and in development wells in northwest Alberta. In October, Alberta Energy Co. (AEC), a joint Provincial Government-private company, purchased the mineral rights to proved reserves in the Suffield Block, a military reserve area in southeast Alberta, from the Government for $54 million. In December, AEC planned a $15 million development program, including 200 producing wells and a pipeline gathering system.

Exploration results were disappointing in the Mackenzie River Delta, Northwest Territories, and the Arctic Islands following successes in 1974. Imperial Oil Ltd. reported a gas discovery in its Beaufort Sea exploration, offshore from the Mackenzie Delta, and Panarctic Oils Ltd. was successful in development wells at its Drake Point Field on the Sabine Peninsula of Melville Island. Reserves there were estimated at 5 trillion cubic feet, but studies indicated that 20 trillion cubic feet would be necessary for commercial development, including a pipeline system.

The Canadian Petroleum Association (CPA) reported marketable natural gas reserves at 56,708 billion cubic feet at yearend 1974, and 56,975 billion cubic feet at yearend 1975. About 80% of these reserves were in Alberta, where they increased from 43,377 billion cubic feet to 45,325 billion cubic feet during the year. Alberta ERCB estimated the proved recoverable reserves in the Province at 51,494 billion cubic feet, higher than that reported by CPA, at yearend, compared with 52,763 billion cubic feet in January.

A Report on Canadian Natural Gas Supply and Requirements, prepared by the National Energy Board (NEB) and released in July, indicated that natural gas supply would be insufficient in the near future to provide for growing domestic demand and export commitments. The NEB recommended improvement in gas delivery systems in Alberta and British Columbia, higher prices to depress demand, and new governmental domestic and export allocation powers.

The wellhead price in Alberta was $0.45 per thousand cubic feet in 1974 and $0.88 per thousand cubic feet in 1975. In June, by Royal assent to the Petroleum Administration Act, the NEB was authorized to achieve a uniform national price, exclusive of transport and service costs. Late in the year, NEB recommended prices for natural gas in various national zones. The Toronto "city gate" price went from $0.82 to $1.25 per thousand cubic feet during the year. The NEB also recommended price increases for Canadian gas sold in the United States,

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[23] Botham, J. C. Coking Coals of Western Canada Assume Growing Importance. The Northern Miner, v. 61, No. 7, May 1, 1975, pp. 35–36.
Botham, J. C., and J. R. Donaldson. Coking Coals of Eastern Canada Differ From Those of the West. The Northern Miner, v. 62, No. 6, Apr. 22, 1976, sec. A, pp. A5–A7.

[24] Western Miner. Hydraulic Mining—Potential Boon to New Coal Development. V. 48, No. 9, September 1975, pp. 11–14.

[25] Canadian Gas Association. Statistical Summary, 1975. Don Mills, Ontario, May 1976, 12 pp.

which was $1.00 per thousand cubic feet in January, $1.40 on August 1, and $1.60 on November 1. Further increases were expected in 1976.

In November, legislation was introduced in Alberta providing for Provincial Government ownership of virtually all natural gas production in the Province and for government price setting. A Natural Gas Pricing Agreement Act would set the Alberta border price at $0.82 per thousand cubic feet, and would grant the Province legal authority to collect export differential revenues. The Government would sell to the United States at the NEB-established price and pay the producer an average price after taking royalty.

A total of 7,600 kilometers was added to gas pipelines, mainly in gathering systems in the shallow gasfields of southern Alberta. NEB also authorized extensions to lines in British Columbia, Ontario, and Quebec. Proposed projects to bring natural gas from Alaska (through Canada), the Mackenzie Delta, and Arctic Islands were under evaluation. Canadian Arctic Gas Study Ltd., a consortium comprising 18 Canadian and U.S. companies, organized a study group to assess its proposed pipeline from Prudhoe Bay, Alaska, to the Mackenzie Delta, and southward to U.S. and Canadian markets.

A Foothills Pipelines Ltd. proposal, called the Maple Leaf Pipeline, was submitted to NEB in April. This pipeline would carry Mackenzie Delta-Beaufort Sea natural gas to the Alberta and British Columbia system for Canadian markets. The proposal assumed future increases in reserves, which were 7.5 trillion cubic feet in 1975, with 19 trillion cubic feet necessary for pipeline development. Early in the year, a commission was established to investigate the social and environmental impact of this proposal, and, in October, the NEB started hearings on this and other pipeline schemes.

There was no change in the Polar Gas Project, which would bring natural gas from the Arctic Islands southward around Hudson Bay. A question of reserve sufficiency remained.

Petroleum.—Output of crude oil continued a decline that started in 1974. Limitations on exports to the United States were the main cause of this decline, leaving substantial shut-in capacity. According to EMR, production (including natural gas liquids and synthetic oil) averaged 1,734,000 barrels per day, down 13% from 1,994,000 barrels per day in 1974. Output of crude oil averaged 1,381,000 barrels per day; condensate and natural gas liquids, 310,000 barrels per day; and synthetic oil, 43,000 barrels per day.

On June 19, a Petroleum Administration Act received Royal assent, having passed the Parliament. The Act provided a legislative basis for the existing export tax on oil and certain refinery products and for a compensation scheme for oil imports in eastern Canada. It also empowered the Federal Government to regulate oil and gas prices in interprovincial and export trade.

According to the CPA, a record $650 million was expended on exploration in 1975, due mainly to rapidly rising costs. Although a total of 4,242 wells were drilled (including a record of 3,652 wells in Alberta), slightly more than in 1974, footage at 13,928,589 feet (4,245,434 meters) was down 4.4% from that of 1974. No major discoveries were made in and near the producing fields, elsewhere in the Provinces, or in the frontier areas (Mackenzie Delta, Beaufort Sea, Arctic Islands, and Atlantic offshore from Nova Scotia, Sable Island, Newfoundland, and Labrador).

In British Columbia, exploration was virtually at a standstill until midyear, when a new Provincial Government tax policy was an incentive to renewed activity. Significant discovery wells were reported at Tableland in southeastern Saskatchewan, the Mackenzie Delta, and Cameron Island. In the northern latitudes, drilling was from ice islands. Imperial Oil Ltd. was the most active company in the Mackenzie Delta area, and Panarctic Oils Ltd., which comprises 25 companies and the Federal Government, was most active in the Arctic Islands. A NEB study on oil reserves in the Mackenzie Delta area indicated a maximum of 1 billion barrels and the necessity for 3 billion to 5 billion barrels in reserves for commercial development and a pipeline. Although exploration in the Atlantic offshore areas was unsuccessful, resource potential was considered good.[26]

According to the CPA, reserves of crude oil and natural gas liquids were revised

[26] Millan, S. M. The Province of Newfoundland and Labrador—Offshore Petroleum Resources. Dept. of Energy, Mines and Resources. St. Johns, Newfoundland, Sept. 12, 1975, 17 pp.

downward as follows at yearend, in thousand barrels:

	1974	1975
Proved	8,791,399	8,239,056
Probable additional	1,385,051	1,345,497
Total	10,176,450	9,584,553

About 88% of this reserve was in Alberta. The CPA estimate for this Province was lower than that prepared by the Alberta ERCB, which revised the Provincial reserve as follows, in million barrels: [27]

	Jan. 1, 1975	Revision to reserve estimate	Production	Dec. 31, 1975
Crude oil	6,365	+44	−425	5,984
Natural gas liquids	1,958.2	−40.6	−108.9	1,808.7

Considering advances in new recovery technology, ultimate recoverable oil reserves were increased to 18 billion barrels, of which 11.5 billion barrels were considered substantiated at yearend.

CPA reported total crude oil pipeline mileage as of January 1, 1975, at 19,323 miles (31,097 kilometers), including gathering, trunk, and product lines. In May, NEB announced authorization for Interprovincial Pipe Line Ltd. to start construction of an 830-kilometer crude oil pipeline from Sarnia, Ontario, to refineries in the Montreal area. Capacity will be 350,000 barrels per day, but initial throughput will be 250,000 barrels per day. The line will be an extension to an existing system carrying Western crude oil to Ontario. With Government subsidization, Western crude will be delivered in Montreal at Toronto prices, pending a NEB decision on tariff rates for the entire pipeline system. This pipeline extension was expected to save on oil import costs in the eastern Provinces.

Crude oil exports to the United States averaged 707,000 barrels per day, down from the 1974 rate and scheduled to be reduced further in future years, based on an export control system, adopted in 1974, for conserving petroleum resources. The U.S. allocation was reduced to 800,000 barrels per day on January 1, 650,000 barrels per day on July 1, then raised to 750,000 barrels per day later in the year. The schedule called for reductions to 365,000 barrels per day in two stages in 1976 and the phasing out of exports by 1981. In the meantime, crude imports increased by about 6,000 barrels per day to an average of 824,000 barrels per day for the year, and Canada was a net importer of crude oil for the first time since 1970. With growing demand and decreasing production, Canada was expected to continue as a net importer of crude oil in the future.

The crude oil price, which averaged $5.72 per barrel in 1974 according to CPA, was raised to $8 at the wellhead, effective July 1. Governments of the oil-producing Provinces want prices increased to international levels.

Petro-Canada, established as a Federal Crown corporation with Royal assent on July 30, was to commence operations on January 1, 1976, with headquarters in Calgary, Alberta. Its initial top priority will be exploration and development, starting in the frontier areas, but it was expected to become involved eventually in the full range of activities from exploration to marketing. Petro-Canada was committed to an expenditure of $300 million for a 15% interest in Syncrude Canada Ltd., an operating company for a project for the recovery of oil from the Athabasca bituminous sands.

Demand for crude oil at 41 operating refineries was about 1,702,000 barrels per day, below that of 1974, due to reductions in deliveries of Western crude to Quebec and Maritime refineries. Total annual capacity increased to nearly 2 million barrels per day for the first time, with new capacity onstream during the year. Irving Oil Co. Ltd. completed expansion at its St. Johns refinery, New Brunswick, from 120,000 to 250,000 barrels per day, the largest in Canada. A new 145,000-barrel-per-day refinery of Imperial Oil Ltd. near Edmonton, Alberta, at the site of an existing refinery, was near completion at yearend. Imperial will phase out three refineries of small capacity at Calgary in Alberta, Regina in Saskatchewan, and Winnipeg in Manitoba, and convert them to distribution terminals for refinery products.

Synthetic Crude Oil.—Production by Great Canadian Oil Sands Ltd. (GCOS), the only commercial producer of synthetic crude from the bituminous sands at Athabasca, Alberta, averaged about 43,000 bar-

[27] Province of Alberta, Energy Resources Conservation Board. Reserves of Crude Oil, Gas, Natural Gas Liquids, and Sulphur. ERCB-76-18, Calgary, Alberta, Dec. 31, 1975, pp. 2-1—2-85, 7-1—7-11.

Table 18.—Canada: Petroleum refineries, 1975 [1]

Province or Territory	Location	Company	Crude oil throughput capacity (thousand barrels per day)
Newfoundland	Holyrood	Golden Eagle Canada Ltd	14.0
Do	Come-by-Chance	Newfoundland Refining Ltd	100.0
Nova Scotia	Point Tupper	Gulf Oil Canada Ltd	80.0
Do	Dartmouth	Imperial Oil Ltd	82.5
Do	Halifax	Texaco Canada Ltd	18.0
New Brunswick	St. John	Irving Refining Ltd	[2] 120.0
Quebec	Montreal	BP Refining Canada Ltd	73.0
Do	St. Roumauld	Golden Eagle Canada Ltd	100.0
Do	Montreal	Gulf Oil Canada Ltd	67.5
Do	do	Imperial Oil Ltd	106.0
Do	Pointe-aux-Trembles	Petrofina Canada Ltd	95.0
Do	Montreal	Shell Canada Ltd	120.0
Do	do	Texaco Canada Ltd	73.0
Ontario	Oakville	BP Refinery Canada Ltd	76.0
Do	Clarkson	Gulf Oil Canada Ltd	62.4
Do	Sarnia	Imperial Oil Ltd	130.3
Do	Port Credit	Texaco Canada Ltd	48.0
Do	Corunna	Shell Canada Ltd	80.0
Do	Oakville	do	42.0
Do	Sarnia	Sun Oil Co. Ltd	84.0
Manitoba	Winnipeg	Imperial Oil Ltd	21.4
Do	St. Boniface	Shell Canada Ltd	27.0
Saskatchewan	Regina	Consumers' Cooperative Refineries Ltd	25.0
Do	Moose Jaw	Gulf Oil Canada Ltd	10.3
Do	Regina	Imperial Oil Ltd	30.7
Do	Kamsack	Canadian Propane Gas & Oil (Saskatchewan) Ltd	1.2
Alberta	Calgary	Gulf Oil Canada Ltd	6.7
Do	Edmonton	do	74.6
Do	Lloydminster	Husky Oil Ltd	11.5
Do	Calgary	Imperial Oil Ltd	21.2
Do	Edmonton	do	[2] 37.8
Do	Bowden	Shell Canada Ltd	5.0
Do	Edmonton	Texaco Canada Ltd	21.0
British Columbia	North Barnaby	Chevron Canada Ltd	4.5
Do	Kamloops	Gulf Oil Canada Ltd	7.7
Do	Port Moody	do	37.7
Do	Ioco	Imperial Oil Ltd	36.8
Do	Taylor	Pacific Petroleums Ltd	10.9
Do	North Barnaby	Shell Canada Ltd	22.0
Do	Prince George	Union Oil Co. of Canada Ltd	8.0
Northwest Territories	Norman Wells	Imperial Oil Ltd	2.8
Total			1,995.5

[1] As of Jan. 1, 1975.
[2] Under expansion during year.

Sources: Canadian Petroleum Association and Department of Energy, Mines and Resources, Ottawa.

rels per day, compared with 46,200 barrels per day in 1974. In addition, about 1,200 barrels per day was produced at a number of experimental projects, mainly for in situ recovery. GCOS decided to defer a planned expansion of production to 65,000 barrels per day and work on improved oil recovery. For a rated 55,000-barrel-per-day operation, it would be necessary to strip 40,000 tons of overburden per day and mine 130,000 tons of bituminous sands per day.[28]

The Syncrude Canada project, located 48 kilometers north of Fort McMurray, Alberta, faced a financial problem following a decision by Atlantic Richfield Canada Ltd. in 1974 to withdraw from the operating joint venture that also included Canada Cities Service Ltd., Imperial Oil Ltd., and Gulf Oil Canada Ltd. Costs for the 125,000-barrel-per-day project had doubled from the $1 billion originally estimated. In February an agreement was reached providing Federal and Provincial Government participation and ownership. The Federal Government acquired a 15% ownership with $300 million equity funds; the Government of Alberta, 10% for $200

[28] Western Miner. Oil Sand Operations Have to Overcome Technical, Manpower, Cost Problems. V. 48, No. 9, September 1975, pp. 21–22.

million; and the Government of Ontario, 5% for $100 million. The private ownership was Imperial 31.25%, Canada Cities Service 22%, and Gulf Canada 16.75%. These three operating companies increased their investment by $400 million, which included a $200 million loan from the Alberta Government. This Government was also committed to $500 million to $600 million for a powerplant, pipeline, housing, and infrastructure and held a 20% participation option, acquired through the Alberta Energy Co. in 1973. Agreement between the operating companies and the Government interests provided for a 50–50 profit split, the right to receive the world price for oil, exclusion from any prorationing of production, no royalty payments, and assumption of a share of future losses, if any, by the Government interests.

At yearend, the Snycrude project was on schedule, despite labor problems and shortages of equipment, and was at 35% of completion, which was scheduled for late 1978 or in 1979 when initial production at 52,000 barrels per day was anticipated. Two draglines for stripping overburden and three bucket wheels for mining were ordered.[29]

Other proposed new Athabasca sands projects, approved by the Alberta ERCB, were slowed by shortages of investment capital, rising costs, and uncertainty concerning the future of this emerging industry. These included Shell Canada Ltd. (100,000 barrels per day), which deferred its project; the Petrofina Canada Ltd. consortium (122,500 barrels per day), which was reassessing its project; and Home Oil Co. Ltd.-Alminex Ltd. (103,000 barrels per day), which also deferred further work.

In addition to these proposed conventional mining ventures, a number of projects for in situ recovery of oil from the sands were at the experimental or pilot plant stage in four areas of interest—Athabasca (the main area of activity because of least overburden), Cold Lake, Peace River, and Wabasco. These projects involved steam injection and/or waterflooding. In July the Oil Sands Technology and Research Authority was established in Alberta to consider financing joint-venture experimental in situ projects. A $100 million fund was provided to the Authority.

An ERCB study established recoverable reserves of 26.5 billion barrels for areas considered minable by conventional open pit methods (overburden less than 46 meters thick). Ultimate reserves in place in presently delineated oil sands were considered to be as much as 1 trillion barrels.

In March, Federal-Alberta Government authorities established the Alberta Oil Sands Environmental Research Program to devise measures for environmental protection in the oil sand operations. A $40 million fund was provided for a 5-year program, renewable for an additional 5 years.

Uranium.—Output was higher than that of 1974, and shipments increased to about 5,500 tons U_3O_8. Escalating uranium prices throughout the year spurred mining activity and permitted the working of lower grade ores. Expansions to mine and mill capacities underway or planned at the four producing operations created manpower shortages, which could become more serious if training and related programs are not successful. Training programs were expanded, and new housing facilities were under construction. Staff-shuttling, started by Gulf Minerals Canada Ltd.-Uranerz Canada Ltd. at Rabbit Lake, northern Saskatchewan, was considered by other producers for mines in the more remote regions. Labor needs by Denison Mines Ltd. and Rio Algom Mines Ltd. in the Elliot Lake district were expected to increase threefold by 1983, if the two companies were to meet their uranium sales commitments.[30]

Denison Mines, the leading producer, increased output to 1,320 tons U_3O_8 at Elliot Lake, Ontario, compared with 1,270 tons in 1974, according to the company's annual report for 1975. Denison continued mine expansion to 7,100 tons of ore per day (2,300 tons U_3O_8 per year), scheduled for completion late in 1976, and planned a further expansion to 9,000 tons per day.

Rio Algom also was expanding capacity at mines in the same district and at its Quirke Lake mill from 4,100 to 6,400 tons of ore per day, and planned to reopen and develop mines and reactivate an idle mill. Eldorado Nuclear Ltd., the Federal Crown company, planned expansion at Uranium City, Saskatchewan, to 900 tons U_3O_8 by 1979. The fourth operable mine, that of Gulf Minerals-Uranerz at Rabbit Lake, Saskatchewan, the first new uranium mine in 25 years, started "break-in" oper-

[29] Mining Magazine. Mining the Athabasca Tar Sands. V. 132, No. 1, January 1975, pp. 14–15, 17, 19, 21–23.

[30] The Northern Miner. Uranium Workers Must Triple by 1983. V. 61, No. 38, Dec. 4, 1975, p. 5.

ations late in the year. Mill capacity is 2,000 tons U_3O_8 per year.

Three properties were under development: Amok Ltd. at Cluff Lake, northern Saskatchewan, where construction was to start in 1976 for 1,800 tons U_3O_8 per year in 1978-79; Agnew Lake Mines Ltd. at Agnew Lake, 50 kilometers west of Sudbury, Ontario, where preparations for an in situ leach operation continued; and Madawaska Mines Ltd., near Bancroft, Ontario, where the Faraday mine was being reactivated.

The Atomic Energy Control Board authorized export of 66,800 tons U_3O_8, effective September 1974, in line with established new export guidelines. Domestic utilities were required to contract for 15-year fuel needs for operating and committed nuclear generating capacity. About 100,000 tons U_3O_8 have been committed in export contracts. Denison Mines alone had export contracts for 37,000 tons U_3O_8 covering operations through 1994, according to the company's annual report for 1975.

With the spot price near $30 per pound U_3O_8 and rising at yearend and projected high demand worldwide, exploration activity for uranium was extensive throughout Canada, involving small to large companies in all Provinces and the Territories. A number of significant discoveries were reported. The Geological Survey of Canada started a $30 million, 10-year reconnaissance for uranium in participation with the Provincial Governments. The program includes airborne gamma spectrometry and regional geochemical surveys and will cover two-thirds of Canada by 1985.[31] Of particular interest was an underwater exploration project in northern Saskatchewan, where a scuba diver team with experimental scintillation detection equipment was testing the floor in a series of small lakes along a fault, and at Lake Athabasca where detection equipment, towed by a boat, will test the entire lake floor under a large radiometric program.

The Uranium Resource Appraisel Group, set up by EMR in 1974, reported uranium resources, as of yearend 1975, as follows, in thousand tons U_3O_8:

Price (per pound U_3O_8)	Measured	Indicated	Inferred	Total
Up to $20	74	97	205	376
$20–$40	13	20	101	134
Total	87	117	306	510

This total was 33,000 tons of U_3O_8 more than that reported for a $30 price at yearend 1974. Resources were estimated only for the principal deposits, since data were incomplete or lacking for other known deposits, and were expected to increase further in 1976 as new exploration data became available. EMR reported "prognosticated' (potential) resources for the first time; they were 450,000 tons U_3O_8 at prices up to $40.[32]

Eldorado Nuclear Ltd. produced 4,130 tons of U_3O_8 nearly double that of 1974, with increased utilization of capacity and improved control of chemical circuits at the Port Hope refinery, Ontario, the only uranium refinery in Canada. The company also produced 540 tons of ceramic-grade UO_2 in powder form, similar to the 1974 output, for CANDU nuclear fuels, and 2,450 tons of UF_6, 20% greater than in 1974, for enrichment services.[33]

Atomic Energy of Canada Ltd. reported 2,536 megawatts electrical of operating nuclear capacity in CANDU reactors, and 9,397 megawatts electrical under construction or planned.[34]

Table 19.—Canada: CANDU reactors, 1975

Province	Name	Capacity (net megawatts electric)
Operating:		
Ontario	NPD	22
Do	Douglas Point	208
Do	Pickering A	[1] 2,056
Quebec	Gentilly 1	250
Under construction or planned:		
Ontario	Bruce A	[1] 2,984
Do	Pickering B	[1] 2,064
Do	Bruce B	[1] 3,076
Quebec	Gentilly 2	638
New Brunswick	Point Lepreau	635
Total		11,933

[1] Four-unit installations.

Source: Atomic Energy of Canada Ltd.

[31] Darnley, A. G., E. M. Cameron, and K. A. Richardson. The Federal-Provincial Uranium Reconnaissance Program. Uranium Exploration '75. Geol. Survey Can., Paper 75-26, pp. 49-71.

[32] Dept. of Energy, Mines and Resources. 1975 Assessment of Canada's Uranium Supply and Demand. Ottawa, June 1976, 9 pp.

[33] Eldorado Nuclear Ltd. Annual Report 1975. Ottawa, 16 pp.

[34] Atomic Energy of Canada Ltd. Annual Report 1975-1976. June 1976, 59 pp.

The Mineral Industry of Chile

By Charlie Wyche [1]

The worldwide economic recession, which forced the industrialized countries to reduce their mineral activity, had a profound influence on Chile's mining industry in 1975. The Chilean economy was subjected to a severe economic recession brought on by greatly depressed copper prices and past economic problems. The gross domestic product (GDP) declined nearly 15%. Minerals remained Chile's most important commercial activity, but declining copper demand and declining metal prices resulted in a drop of about 8% in total mine output. The industry was also affected by the agreement of Conseil Intergouvernemental Des Pays Exportateurs De Cuivre (CIPEC) to reduce copper production and exports 15% in an attempt to support prices. Copper exports accounted for over 80% of the nation's foreign-exchange earnings.

Traditionally, Chile's output of copper had been about 12% of world copper production and about 18% of world copper trade. With Chilean identified reserves estimated at over 75 million tons of copper, or about 20% of known world copper reserves, this world standing could continue. Moreover, the grade of porphyry copper ores in Chile tends to be higher than that found elsewhere in the world.

Chile's copper industry is divided into major, medium, and small sectors, which accounted for about 83%, 8%, and 9%, respectively, of total Chilean copper production. Corporacíon del Cobre (CODELCO) is the state body responsible for administering the four copper mines that constitute the major mining sector of the copper industry. The annual output from each major mine is generally over 75,000 tons. The medium mining sector (less than 10 mines) produced a combined total of 68,000 tons of copper in 1975. Except for one mine (Disputada), these medium mines were in private hands. The small mining sector was composed of hundreds of independent companies or cooperatives, which employed from 1 to 50 workers each. The small miners sell their ores to agents of the Government's Empresa Nacional de Mineria (ENAMI), which owned and operated several beneficiation plants as well as a smelter at Paipote. ENAMI also operated a smelter and refinery at Ventanas, and bought gold and silver ores.

Chile was also a large producer of iodine, molybdenum, and silver, all of which showed an output decline in 1975. In addition, commodities such as iron ore, limestone, manganese, mercury, petroleum, selenium, sodium chloride, sodium sulfate, and zinc were produced. For most of these products, 1975 production was below that reported for 1974.

Chile's balance-of-trade position improved in 1975 despite a decrease in the international price of copper and the rising foreign debt. At the beginning of 1975, a potential deficit of approximately $800 million [2] was projected, but the actual deficit was $260 million. The main reason for this improvement was the substantial decrease in the level of imports and the important growth of nonmineral export products.

The World Bank approved a $30-million loan to assist Chile in expanding its existing capacity to process copper ore and byproducts. The loan was to support investment subprojects undertaken by CODELCO and ENAMI. Under this program, technical assistance could also be provided to strengthen the management of both agencies and to improve planning and policy-making for the mining sector.

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[1] Physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from Chilean Escudos (CEsc) to U.S. dollars at the rate of CEsc72=US$1.00.

Government Policies and Programs.—Citing the international economic crisis and the sharp decrease in the price of copper, the Chilean Government promulgated a new foreign investment law, Decree Law No. 966, published in April 1975. The law permitted 100% foreign ownership in new mining developments. In 1974, the Government owned at least a 51% interest in all major mines, while foreign companies could own a majority interest only in medium or small mines. Because of the new law, the Government's Committee on Foreign Investment (CFI) approved projects valued at about $300 million. This did not include contracts still being negotiated for large copper deposits such as Andacollo, El Abra, Los Pelambres, and Quebrada Blanca, or for exploitation of the Santa Clara iron property by Ataka Mitsubishi. The country's exclusive control of uranium deposits was under review, and a decree law permitting foreign investment in this area was expected. CFI also provided for full repayment of profits, repatriation of invested capital, and the payment of interest in foreign exchange to the investor.

The Chilean Government outlined a new administrative structure for the copper industry that was to become effective on April 1, 1976. The new legislation would dissolve the old CODELCO and the five existing mining corporations and create the Corporacíon Nacional del Cobre de Chile (CODELCO-CHILE). The principal objective of CODELCO-CHILE would be to exercise the rights acquired by the state in the major mine sector of the copper industry, and in the Andina Mining Co. through nationalization. It will continue to exploit the nationalized deposits, and manage the establishments, plants, and related services. CODELCO-CHILE would market copper and its byproducts, all forms of copper ore and concentrates, and other nonferrous metals. It would promote geological and technical research in mining, metallurgical, and industrial processes for copper and related products. It would also advise CFI regarding exploitation and supervise contracts between the Government and foreign investors.

The world's major copper-exporting nations met in Lima, Peru, November 18–20, 1975, and reversed an 8-year policy of not discussing copper-trade-related matters with copper-consuming nations. The conference decided that CIPEC, through its president, should initiate a dialogue between producing and consuming countries with intentions of negotiating copper prices that would be fair to both producers and consumers. CIPEC ministers also decided to maintain the 15% production cutback (from 1974 levels) imposed upon founding members until June 30, 1976. The organization also announced plans to prepare a study on financing and operating a buffer stock.

CIPEC increased its membership by three countries during the meeting. Indonesia became a full member, and Australia and Papua New Guinea became associate members. Additionally, Mauritania applied for associate status during the meeting and will be accepted in 1976. CIPEC claimed to represent 72% of the world's copper exports.

PRODUCTION

Owing to lower demand, output of many commodities declined during 1975. Voluntary cutbacks by the producers of copper, iodine, molybdenum, and silver resulted from a decline in world demand. Chile maintained its position as the world's second-largest producer of copper, and was third in molybdenum, and eighth in silver. Both smelter and refinery output of copper decreased slightly. Mine production of copper and molybdenum was down 8% and 7%, respectively. Output of coal remained steady, but that for natural gas and crude petroleum increased slightly. Decreases were also recorded for both potassium and sodium nitrate.

Table 1.—Chile: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Copper:			
Mine output, metal content [2]	735,400	902,100	828,300
Metal:			
Smelter [3]	589,900	724,300	724,400
Refined: [4]			
Fire refined	78,200	112,200	125,300
Electrolytic	336,600	425,900	409,900
Gold, mine output, metal content troy ounces	97,995	118,829	130,651
Iron and steel:			
Ore and concentrate thousand tons	9,402	10,292	11,007
Pig iron do	458	532	417
Ferroalloys do	11	15	13
Crude steel [5] do	[r] 549	635	481
Semimanufactures (hot-rolled) do	435	483	387
Lead, mine output, metal content	256	420	309
Manganese ore and concentrate	14,434	28,695	20,016
Mercury 76-pound flasks	798	921	97
Molybdenum, mine output, metal content	4,843	9,757	9,091
Selenium kilograms	[e] 18,000	[e] 18,000	11,819
Silver thousand troy ounces	5,035	6,646	6,263
Vanadium, mine output, metal content [e]	960	580	600
Zinc, mine output, metal content	1,602	3,349	3,174
NONMETALS			
Barite	4,696	4,194	5,982
Borates, crude, natural	1,532	968	--
Cement, hydraulic thousand tons	1,378	1,425	1,002
Clays:			
Kaolin	44,753	74,979	59,532
Other (unspecified)	123,209	152,632	42,099
Diatomite	886	2,290	186
Feldspar	530	2,806	382
Fertilizer materials, crude:			
Nitrates:			
Sodium	544,085	664,185	656,250
Potassium enriched	152,424	74,615	[e] 70,000
Phosphates, guano	12,976	18,600	13,579
Gem stones, lapis lazuli kilograms	7,844	--	1,700
Gypsum:			
Crude	88,554	135,111	139,429
Calcined	67,096	59,631	41,463
Iodine, elemental	2,211	2,273	1,962
Kyanite and related materials:			
Andalusite	NA	5,447	NA
Pigments, natural mineral, iron oxides	23,762	16,482	9,805
Pozzolan	142,415	162,491	NA
Pumice	NA	14,250	NA
Quartz:			
Common quartz	139,589	202,624	115,838
Glass sand	7,700		2,268
Salt, all types thousand tons	345	239	299
Stone:			
Limestone do	2,112	2,596	1,518
Marble	785	497	399
Sulfate, sodium:			
Natural, mined	4,773	41,384	34,592
Anhydrous, coproduct of nitrate industry	35,950		
Sulfur:			
Native, other than Frasch:			
Refined	8,273	7,528	4,940
Caliche	22,835	24,672	16,411
Byproduct (from industrial gases)	15,945	23,310	26,052
Total	47,053	55,510	47,403
Talc	1,758	1,684	475
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous and lignite thousand tons	1,425	1,520	1,483
Coke:			
Coke oven do	300	303	211
Gashouse do	--	--	5
Gas, natural:			
Gross production million cubic feet	260,496	248,687	250,625
Marketed do	[r] 144,937	127,503	128,278

See footnotes at end of table.

Table 1.—Chile: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Natural gas liquids, gross production:			
Condensate ---thousand 42-gallon barrels--	949	850	712
Natural gasoline ---do---	1,126	1,112	984
Liquefied petroleum gas ---do---	2,973	3,038	2,986
Total ---do---	5,048	5,000	4,682
Petroleum:			
Crude ---do---	11,429	10,055	8,946
Refinery products:			
Gasoline:			
Aviation ---do---	143	172	107
Motor ---do---	10,466	9,196	7,742
Jet fuel ---do---	715	874	734
Kerosine ---do---	3,852	3,324	2,499
Distillate fuel oil ---do---	5,532	6,633	6,570
Residual fuel oil ---do---	9,793	11,177	7,696
Other:			
Liquefied petroleum gas ---do---	1,999	5,520	5,224
Naphtha ---do---	529	509	448
Asphalt refinery ---do---	46	66	39
Unspecified ---do---	519	711	625
Refinery fuel and losses ---do---	1,644	134	100
Total ---do---	35,238	38,316	31,784

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

[1] In addition to the commodities listed, lime and pyrites 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.

[4] Figures presented are total refined copper distributed into two classes according to method of refining.

[5] Excluding castings.

TRADE

Chile's foreign-exchange earnings from copper exports decreased more than 50% in 1975 because of low prices in world markets. Government officials reported that Chilean copper shipments during 1975 brought in $915 million compared with $1.9 billion in 1974.

Copper accounted for approximately 80% of the country's foreign-exchange earnings. Chile was the world's second-largest copper exporter. Shipments of 869,000 tons accounted for about 20% of net world copper exports. Chile's copper markets were diversified, and about one-half of its exports were to Japan, the United Kingdom, the United States, and West Germany. In addition, shipments were made to Argentina, Brazil, Canada, France, and the People's Republic of China, and exports to Iran were resumed.

Iron ore remained Chile's second-largest mineral export earner. Approximately 85% of the total production of iron ore was exported for an income of about $90 million. Nitrate exports, the third-largest earner, were down 29%, while iodine exports decreased 57%.

Exports of nitrate fertilizers total 497,100 tons valued at $51,610,000 in 1975, compared with 311,720 tons valued at $42,238,400 in 1974. About 80% of Chilean nitrate sales went to the agricultural market; the balance was used in explosives and in production of nitric acid. Exports of sodium nitrate, essentially to Western Europe, the United States, and Brazil, totaled a combined value of $28 million. Shipments of potassium nitrate, valued at $10 million, went to the United States, Brazil, and China.

Imports of crude oil declined about 18%, despite the decrease in domestic production of 11% in 1975. This was attributed to a sharp decline in consumption of crude oil in Chile from an average of about 104,000 barrels per day in 1974 to about 88,000 barrels per day in 1975, a decline of close to 16%. This correlated closely with the overall decline of the GDP. Imports of 23 million barrels of crude petroleum cost $227 million in 1975, compared with 29 million barrels costing $338 million in 1974.

Table 2.—Chile: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Copper:			
Ore and concentrate [1]	62,704	101,368	West Germany 32,953; Mozambique 27,192; Greece 15,082.
Copper sulfate	1,183	1,266	Brazil 1,180.
Metal including alloys:			
Scrap	828	--	
Unwrought	626,195	855,197	West Germany 115,791; United Kingdom 100,405; United States 95,108.
Semimanufactures	17,979	167,642	Japan 126,870; West Germany 18,582.
Gold ore and concentrate [2]	45,927	1,790	All to West Germany.
Iron and steel:			
Ore and concentrate ..thousand tons..	8,122	9,390	Japan 8,788.
Metal:			
Ferroalloys	2,516	1,564	Colombia 515; Republic of South Africa 197; Argentina 196.
Steel, primary forms	--	348	All to Bolivia.
Semimanufactures	(3)	258	Brazil 254.
Lead metal including alloys, all forms	--	410	All to Belgium-Luxembourg.
Mercury ..76-pound flasks..	10	--	
Molybdenum metal including alloys, all forms	3,606	6,391	Canada 1,800; Netherlands 859; United Kingdom 839.
Selenium, elemental ..kilograms..	8,450	3,500	Netherlands 2,000; United Kingdom 1,000; Argentina 500.
Silver:			
Ore and concentrate [4]	54,398	58,582	Japan 36,809; Canada 16,813.
Metal including alloys	14	48	West Germany 16; United States 15; France 10.
Other:			
Ore and concentrate:			
Of molybdenum, tantalum, titanium, vanadium	--	4,629	Netherlands 943; West Germany 851; Canada 811.
Of base metals n.e.s	--	--	
Ash and residue containing nonferrous metals	55,742	79,613	Canada 54,354; Australia 18,000.
Oxides, hydroxides, and peroxides of metals n.e.s	3,659	4,608	Japan 1,874; West Germany 1,708.
NONMETALS			
Diamond, worked and unworked ..kilograms..	2,283	800	All to Argentina.
Fertilizer materials:			
Crude:			
Nitrogenous	341,484	424,296	United States 113,123; Netherlands 80,080.
Potassic	30	22,757	United States 12,330; People's Republic of China 10,427.
Manufactured:			
Nitrogenous	8,123	4,200	United States 4,200.
Other including mixed	70,275	38,236	People's Republic of China 17,540; United States 10,200.
Iodine	1,920	1,766	Netherlands 1,011; People's Republic of China 318; United States 229.
Precious and semiprecious stones, worked and unworked ..kilograms..	6,355	10,019	West Germany 5,877; Italy 2,247; United States 1,048.
Salt	109,363	54,896	United States 43,080; Nicaragua 11,816.
Stone, sand and gravel, dimension stone, crude and partly worked	2	2	All to United States.
MINERAL FUELS AND RELATED MATERIALS			
Coal	530	1,172	Bolivia 1,130.
Petroleum:			
Crude ..thousand 42-gallon barrels..	440	--	
Refinery products:			
Gasoline motor ..do..	--	62	Brazil 48; Peru 14.
Other, liquefied petroleum gas ..do..	326	725	Argentina 699.

[1] Additional copper ore and concentrate included in the silver and gold figures, not broken out separately.
[2] Reported as gold, silver and copper, not exclusively gold.
[3] Less than ½ unit.
[4] Reported as silver and copper, not exclusively silver. Additional silver ore and concentrate reported in gold figure, not broken out separately.

Table 3.—Chile: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Bauxite and concentrate	740	--
Oxide and hydroxide	250	308
Metal:		
Scrap	33	2
Unwrought	3,238	3,219
Semimanufactures	1,730	1,550
Antimony metal including alloys, all forms	175	176
Arsenic:		
Trioxide, pentoxide and acids	271	111
Metal including alloys, all forms	(1)	(1)
Bismuth metal including alloys, all forms ____kilograms	1	(1)
Cadmium metal including alloys, all forms	3	3
Chromium:		
Chromite	29	35
Oxide and hydroxide	36	53
Metal including alloys, all forms	2	(1)
Cobalt:		
Oxide and hydroxide	3	4
Metal including alloys, all forms	(1)	(1)
Copper metal including alloys, semimanufactures	156	153
Gold metal, unworked or partly worked ____troy ounces	2,823	2,136
Iron and Steel:		
Metal:		
Scrap	14,462	10,724
Pig iron, cast iron	395	3,501
Sponge iron, powder and shot	310	109
Ferroalloys:		
Ferrochromium	131	504
Ferrosilicon	5	14
Other	87	166
Steel, primary forms	16,678	22,370
Semimanufactures:		
Bars, rods, angles, shapes, sections	11,301	34,008
Universals, plates, sheets	1	1
Hoop and strip	397	231
Rails and accessories	9,380	9,624
Wire	1,326	1,565
Tubes, pipes, castings	5,828	14,275
Castings and forgings, rough	22,388	3,687
Ingots and semimanufactures of high carbon and alloy steel	5,267	11,235
Lead:		
Oxides	1	1
Metal including alloys:		
Unwrought	3,209	3,306
Semimanufactures	57	117
Magnesium metal including alloys, all forms	3	7
Manganese:		
Ore and concentrate	40	30
Oxides	87	116
Metal	5	11
Molybdenum metal including alloys, all forms	(1)	--
Nickel:		
Matte, speiss and similar materials	--	5
Metal including alloys:		
Scrap	26	(1)
Unwrought	65	56
Semimanufactures	80	186
Platinum-group metals including alloys, all forms ____troy ounces	774	278
Rare-earth metals:		
Oxides	1	1
Metals including alloys ____kilograms	2	144
Selenium, elemental ____do	51	1
Silver metal including alloys ____thousand troy ounces	729	27,377
Tin:		
Oxides	3	4
Metal including alloys, all forms	428	2,235
Titanium:		
Oxides	1,288	2,744
Metal including alloys, all forms	1	(1)
Tungsten metal including alloys, all forms ____kilograms	58	793
Uranium:		
Oxide ____do	--	10
Metal including alloys, all forms ____do	--	39
Vanadium, oxides	--	50

See footnote at end of table.

Table 3.—Chile: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS—Continued		
Thorium: Thoria	2	2
Zinc:		
Oxide	2	44
Metal including alloys:		
Scrap and blue powder	36	60
Unwrought	4,086	10,911
Semimanufactures	--	(1)
Zirconium:		
Ore and concentrate	--	60
Metal including alloys, all forms ____kilograms	1	--
Other:		
Ore and concentrate:		
Of molybdenum, tantalum, titanium, vanadium	--	74
Of base metals, n.e.s	--	194
Ash and residue containing nonferrous metals	882	201
Oxides, hydroxides, peroxides of metals n.e.s	42	48
Metal including alloys, all forms:		
Alkali, alkaline earth, rare-earth metals ____kilograms	236	1,224
Pyrophoric alloys ____do	850	792
Base metals including alloys, all forms, n.e.s	(1)	2
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	18	79
Dust and powder of precious and semiprecious stones ____kilograms	3	--
Grinding and polishing wheels and stones	127	444
Asbestos	11,010	12,656
Barite and witherite	21	957
Boron materials, oxide and acid	76	30
Bromine	(1)	1
Cement	29,286	9,208
Clays and clay products (including all refractory brick):		
Crude clays n.e.s.:		
Bentonite	3,932	5,559
Kaolin	669	563
Other	57	122
Products:		
Refractory	5,019	26,628
Nonrefractory	599	68
Cryolite and chiolite	5	(1)
Diamond, industrial ____carats	32,665	51,055
Diatomite and other infusorial earth	516	108
Fertilizer materials, crude and manufactured:		
Nitrogenous	7,850	39,056
Phosphatic	190,715	198,936
Potassic	39,004	73,490
Other including mixed	117,998	100,661
Fluorspar	1,309	3,876
Graphite, natural	176	250
Gypsum and plasters	(1)	(1)
Iodine	1	(1)
Lime	31	30
Magnesite	1,503	10,493
Mica:		
Crude including splittings and waste	17	50
Worked including agglomerated splittings	3	5
Pigments, mineral, processed iron oxides	111	126
Precious and semiprecious stones, except diamond, natural ____carats	125,615	579,150
Salt	108	7
Sodium and potassium compounds, n.e.s.:		
Caustic soda	2,812	12,370
Caustic potash, sodic, potassic peroxides	176	147
Stone, sand and gravel:		
Dimension stone	8	12
Dolomite, chiefly refractory grade	22,927	559,002
Gravel and crushed rock	22	63
Quartz and quartzite	19	48
Sand, excluding metal bearing	9	4
Sulfur:		
Elemental all forms	424,944	103,833
Sulfur dioxide	(1)	(1)
Sulfuric acid	22	(1)
Talc, steatite, soapstone, pyrophyllite	830	897

See footnote at end of table.

Table 3.—Chile: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Other:		
Crude	194	814
Slag, dross and similar waste, not metal bearing	289	230
Oxides and hydroxides of magnesium, strontium, barium	457	343
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals, n.e.s	252	47
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	1,040	660
Carbon black and carbon gas:		
Carbon black	6,839	6,362
Coal, all grades including briquets	240,541	363,243
Coke and semicoke	25,471	83,763
Hydrogen, helium, rare gases	46	104
Petroleum:		
Crude thousand 42-gallon barrels	37,037	29,113
Refinery products:		
Gasoline, motor do	(1)	4
Kerosine do	25	2
Distillate fuel oil do	152	86
Residual fuel oil do	620	1,002
Lubricants:		
Oil do	53	270
Grease do	1	8
Other:		
Liquefied petroleum gas do	376	72
White spirits do	(1)	(1)
Naphtha do	2	(1)
Mineral jelly and wax do	45	69
Nonlubricating oils n.e.s do	14	10
Bitumen and other residues do	(1)	1
Bituminous mixtures n.e.s do	(1)	3
Petroleum coke do	--	--
Pitch do	19	(1)
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	702	789

[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Copper.—Chile copper production (copper in ore) declined 7.8% from that of 1974, according to figures issued by CODELCO. The reduction resulted primarily from Chile's participation in CIPEC and that organization's decision that members reduce production by a total of 15%. In Chile, the cutback was accomplished by closing the Exótica mine, and reducing output about 10% at the other state-owned mines. Production of the medium and small mines was off about 6%.

Total copper production (mine copper content) of all mining operations is shown in table 4.

Production of blister copper at Chile's six smelters was about the same as that in 1974. The output of electrolytic and fire-refined copper also showed little change. CODELCO invested approximately $115 million during 1975 in projects to maintain installed capacity and to lower costs. An investment of $100 million was planned for the same purpose in 1976. The cost of production of the major mines operated by CODELCO was below 50 cents per pound of copper. This figure included operating costs, depreciation of equipment and installations, general marketing, financial expenses, and taxes. Total investments authorized in 1975 amounted to $300 million, mainly for the copper-mining sectors. In December, an agreement was reached between the Chilean Government and Noranda Mines Ltd. of Canada for the development of the Andacollo mine, which will involve an initial investment of $260 million.

The CODELCO group planned to increase production in 1976 about 15% over the 1975 levels. This would be in line with the agreement reached at CIPEC's November 1975 meeting in Lima, at which members decided to change the basis of calculation of the percentage cutback in production.

Production of electrolytic copper at the Potrerillos refinery of El Salvador increased 2% to 64,600 tons, and blister copper output was up 2% to 81,400 tons. Production would have been higher except for the CIPEC restraints on copper producers. The El Salvador concentrator processed about 13,500 tons per day of ore. This highly efficient unit produced a concentrate of 45% copper and 0.85% molybdenum. The total recovery rate was over 90%. The concentrates were piped by gravity to Llanta, about 20 kilometers from the mine. At Llanta a tailings-treatment raised the total recovery rate 3%. Both the El Salvador concentrates received by pipeline and the Llanta concentrates were sent by rail to Potrerillos for smelting and refining. Design capacity at El Salvador refinery was 90,000 tons per year of copper. The probable ore reserves in 1975 totaled 300 million tons, grading 1.25% copper.

Table 4.—Chile: Copper mine production

(Metric tons, copper content)

Sector and mine	1974	1975
CODELCO:		
Chuquicamata	356,800	320,400
El Salvador	80,000	81,400
El Teniente	225,500	234,100
Andina	68,400	62,400
Exótica	32,200	--
Total	762,900	698,300
Medium and small mines:		
Mantos Blancos	32,200	30,900
ENAMI	71,200	69,100
Disputada	25,900	23,000
Others	9,900	7,000
Total	139,200	130,000
Grand total	902,100	828,300

Source: Corporación del Cobre. Departamento Estudios, Gerencia De Ventas Estadisticas: Producción y Exportaciónes Chilenas, Año 1976.

During 1975, concentrates from the large Chuquicamata open pit were used to produce 320,400 tons of blister copper, compared with 356,800 tons in 1974. Mining operations were at a rate of between 50,000 to 60,000 tons per day, predominantly sulfide ores. However, enough oxide ore remained to permit operation of the existing leaching and electrowinning facilities. As the mine is worked into the primary mineralization zone, the predominant ore will be chalcopyrite. Although the secondary sulfide ores produced concentrates containing more than 39% copper, chalcopyrite would yield concentrates of about 28% copper. Furthermore, these concentrates would contain a higher iron content, which creates different problems in smelting.

The concentrating plant produced a high volume of over 39% copper concentrate. Concentrate output exceeded smelter capacity, so that a portion had to be sent to Potrerillos or to Ventanas for refining on a toll-charge basis. A part of Chuquicamata concentrates was also exported, mostly to North Korea. Construction of a new Chuquicamata smelter was contemplated, but engineers were developing a system of oxygen feed to the reverberatory furnaces that would greatly increase smelter capacity. A similar system was successfully developed at El Teniente.

The Exótica mine, located about 2 kilometers south of the Chuquicamata pit, remained closed during the year. When in operation, ore from this mine produced a leach solution that contained a colloidal suspension of impurities such as selenium, aluminum, and iron. This inhibited the electrowinning process and produced unmarketable cathodes. The cathodes had to be cast into anodes, and either sold as blister or electro-refined, a process that pushed production costs to over 60 cents per pound. Consequently, when Chile complied with the CIPEC Agreement of 1974 to reduce copper production, it was largely through the closing of the Exótica mine. The mine is scheduled to be reopened in November 1976, but the actual reopening date will depend on copper prices. Ore reserves at Exótica were estimated at 155 million tons, averaging 1.35% copper.

At Mantos Blancos, which remained the largest privately held copper mine in Chile, production of fire refined copper increased 4% to 26,000 tons. About 6 years of reserves (20 million tons of 1.6% copper) were available from the open pit mine, and the company was opening up an underground mine at an investment cost of about $17 million. At Disputada, production of blister copper decreased 9% because of the CIPEC-imposed cutback. Ore reserves at the Disputada mine were estimated at about 100 million tons, grading 1.4% copper.

Mineral Sagasca, S.A., controlled 59% by Continental Copper & Steel Industries, Inc. of Chile, operated at 30% of capacity for the year and produced 5,400 tons of copper. Due to low oxide-leach recovery rates and difficulties in meeting long-term-debt schedules, Sagasca applied to the Chilean Government to suspend operations at yearend.

Sociedad Minera Pudahuel Ltd., owned by private Chilean interests, hired the U.S. firm, Holmes and Narver, as engineer and construction manager for the $40-million Lo Aguirre project near Santiago. The complex, which comprises a mine, mill, solvent extraction plant, and electrowinning plant, could start production in 1978 at an annual capacity of 22,000 tons of cathode copper. The Lo Aguirre deposit contained reported reserves of 10.4 million tons, averaging 2.12% copper.

Of the four large ore bodies being made available for foreign exploitation under the Foreign Investment Law (DL–600) of July 1974, Noranda Mines Ltd. signed a letter of intent on Andacolla, located in Coquimbo Province, with reserves of 193 million tons, averaging 0.75% copper and 0.15% molybdenum. Leon Tempelsman & Sons, of the United States, signed a letter of intent for El Abra, with a minimum 770 million tons grading 0.9% copper, while the other two, Quebrada Blanca and Los Pelambres, were still in an early phase of negotiations.

CODELCO published *El Cobre Chileno–1975*,[3] a comprehensive 500-page book that gives a detailed property-by-property account of all aspects of the Chilean copper industry. The book reported the magnitude of Chile's copper resources at 10.2 billion tons averaging 1.02% copper, with an additional 7.3 billion tons of identified subeconomic resources averaging 0.32% copper. CODELCO invested approximately $115 million to maintain installed capacity and lower production costs, which decreased from 51 cents to 48 cents per pound of copper during the year. The expenditures included expansion of the secondary grinding plant, a new molybdenum recovery plant at Chuquicamata, and the addition of a third reverberatory furnace and expansion of the Rancagua foundry at El Teniente.

Iron Ore.—Output increased nearly 7% over that of 1974. All ore production was controlled by the Government-owned steel company, Compañia de Acero del Pácifico, S.A. (CAP). The average grade of the ore produced was 63% iron. Approximately 85% of the total production was exported for an income of around $90 million. This made iron ore second in importance to copper as an export earner. The Santa Barbara-Santa Fe and El Romeral divisions accounted for 74% of exports.

Iron ore exports were principally to Japan and the United States, which together received about 90% of total exports. Shipments to Chile's Huachipato steel complex for domestic consumption decreased 38% from the 1974 level. Domestic and foreign shipments, by mine, are shown in table 5.

The pelletizing plant and other installations, collectively known as the Huasco Valley project, were over 50% completed and were scheduled to be finished by yearend 1977. Chile began running low on reserves of ore that could be exported without the treatment made possible by this project. The project was funded largely by Mitsubishi Co. Ltd., which signed a sales contract to take 33 million tons of pellets in payment under a 10-year contract.

CAP continued to conduct a feasibility study for a mining facility at the major Cerro Negro iron ore deposits in northern Chile.

Iron and Steel.—Reduced crude steel output, 24% below that of 1974, resulted from a decline in domestic demand. CAP,

[3] Sutulov, A. El Cobre Chileno (Chilean Copper). Editorial Universitaria, Santiago, Chile, 1975.

operating at reduced capacity, supplied 458,000 tons, or 95% of Chile's total steel production. The company produced a wide range of finished and semifinished products, such as bars, plates, galvanized sheets, and tinplate. Pig iron and cast iron production decreased 23% in 1975. CAP had a steel-ingot capacity of 620,000 tons per year at its Huachipato plant. An expansion plan, initiated in the early 1970's to increase production to 1 million tons per year, was delayed because of the decline in steel demand.

Table 5.—Chile: Iron ore shipments by CAP in 1975

(Metric tons)

Mine and product	Quantity
El Romeral Division:	
Blast furnace ore to Japan	1,311,721
Blast furnace ore to Argentina	354,795
Blast furnace ore to CAP steel mill	629,951
Fines to Japan	1,304,608
Total	3,601,075
Santa Barbara-Santa Fe Division:	
Run-of-mine ore to Japan	2,640,714
Run-of-mine ore to Europe	539,523
Blast furnace ore to United States	417,597
Blast furnace ore to Argentina	27,433
Open hearth furnace ore to United States	35,562
Open hearth furnace ore to CAP steel mill	25,401
Total	3,686,230
Algarrobo Division:	
Blast furnace ore to Japan	1,477,337
Fines to Japan	1,301,560
Total	2,778,897
Total shipments, by destination:	
Japan	8,035,939
United States	948,552
Europe	310,091
Argentina	72,139
CAP Huachipato steel mill	663,481
Total	10,030,202

Source: Skillings' Mining Review. V. 65, No. 11, Mar. 13, 1976, p. 8. (Original data in long tons were converted at a factor of 1 long ton equals 1.01605 metric tons.)

Molybdenum.—Molybdenum production showed a 7% decline in 1975, but Chile remained the world's third-largest molybdenum producer. Molybdenum was recovered as a byproduct of Chile's large copper mines, of which the most important was Chuquicamata, followed by El Teniente and El Salvador. In addition, 934 tons of ferromolybdenum and 5,271 tons of molybdenum oxide were produced.

CODELCO planned to open a new $26-million molybdenum plant at Chuquicamata in early 1976. When operating at full capacity, this plant was expected to recover about 13,000 tons per year of molybdenum. A new plant at the Andina mine, with a production capacity of 500 tons per year of molybdenum, was expected to open in 1976. Chilean reserves of molybdenum contained in copper ores were estimated at over 2 million tons.

Precious Metals.—Production of gold increased about 10% above that of 1974. Gold and silver ores supplied 40% of the total gold output, and 60% was recovered as a byproduct of copper production. A recent proposal to remove government control over gold sales was expected to stimulate gold mining.

Domestic silver production was down 6%. Approximately 98% of the production was a byproduct of copper output. Lead-zinc and silver ores accounted for the remainder.

The Coquelimpie silver mine was reopened; it is located in the Arica Plateau about 30 kilometers from the Bolivian border. A flotation installation, with a treatment capacity for 100 tons of mineral per day, yielded about 11 troy ounces of silver and 0.12 troy ounce of gold per ton.

NONMETALS

Cement.—Cement production dropped 30% in 1975, which reflected the slowdown in Chile's construction industry. Despite the relatively low output, Chile remained self-sufficient in cement, and was able to export cement worth $1.2 million, chiefly to Bolivia and Ecuador. Domestic consumption was expected to increase in 1976, but the industry may continue to export part of its production.

Iodine.—Production of iodine declined 13.9% in 1975. Only 75% of contracted sales were completed. Iodine was recovered as a byproduct of nitrate production at three plants owned by Sociedad Quimica y Minera de Chile (SOQUIMICH).

Nitrates.—The Chilean nitrate industry, operated by SOQUIMICH, consisted of four mines. Production of sodium and potassium nitrate was 5.6% and 1.2%, respectively, below 1974 levels. This decrease resulted from insufficient domestic demand brought on by increased prices. A special credit by the Government in late 1975 to consumers for nitrate purchases had a negligible effect on the industry. Exports of sodium nitrate totaled 280,119 tons, a sharp decrease from that of 1974. Of this total, 43% went to Western Europe, 41% to the United States, 7% to Brazil, 4% to Mexico, and the remainder to Japan and Argentina.

Potassium nitrate exports totaled 73,040 tons in 1975; 32% was shipped to the United States, 31% to Brazil, 26% to China, and the balance to Western Europe and Mexico. The $35-million expansion and modernization program begun by SOQUIMICH in late 1974 was nearing completion. The expansion was to increase nitrate production capacity to 850,000 tons in 1975 and to 950,000 tons by 1976. Reserves at operating mines were blocked out for 20 years of operation at 1975 production rates. Additional reserves were developed that would assure production for an additional 50 years. SOQUIMICH estimated that if extractive efficiency could be improved to where 6% ore could be processed, the amount of available reserves would double.

MINERAL FUELS

Coal.—Owing to reduced demand, coal production in Chile declined about 2% from the 1974 level. Receipts of metallurgical coal by CAP, which produced most of Chile's steel, totaled 213,000 tons of domestic and 163,000 tons of imported coking coal. The quantity supplied in 1974 from domestic sources was 222,000 tons, and from foreign sources, 187,000 tons.

Sales were down even more sharply (25%), while stocks increased to a level of 450,000 tons by December 1975. An effort to reduce this high stock level through exports met with little success. Chile planned to ultimately replace high-cost oil with coal for electric power generation at the large copper mines, and also to convert copper smelters and refineries of ENAMI to coal. This program was underway, and could lead to an increase of 350,000 tons in coal consumption in 3 years and 700,000 tons in 5 years. Chile's national coal company, Empresa Nacional del Carbon (ENACAR), also started a program to try to convince other industries to convert to coal. Data were prepared showing that the per calorie cost of coal was between 40% and 60% of that of petroleum for many uses and locations. Such conversion could augment consumption by an additional 200,000 to 250,000 tons per year.

Petroleum and Natural Gas.—The Government of Chile passed Decree Law 1089 in July 1975, which authorized Empresa Nacional del Petroleo (ENAP) to permit foreign companies to explore and exploit hydrocarbon deposits. The decree was flexible but generally provided for 5-year permits with automatic continuations up to 30 years if petroleum was found. ENAP designated seven areas for exploration, but reserved the Springhill District and the Straits of Magellan for itself.

Two areas available to foreign contractors were located near Springfield in southern Chile. Three areas in south-central Chile and one in northern Chile embraced both offshore and onshore areas. From 57 qualified firms, ENAP invited 23 to participate. Of these, 12 indicated interest, and formal invitation letters were sent on October 17 with bids due on February 27, 1976.

ENAP completed 412 kilometers of reflectivity seismic-exploration profiles in 1975, compared with 441 kilometers of reflectivity profiles in 1974. Drilling activity decreased to 65 holes, with a cumulative length of 129,000 meters, compared with 67 holes and 150,000 meters in 1974. Of the total length drilled, 55 holes and 131,000 meters were in Magallanes Province; the remainder was in the south-central zone. The types of wells drilled and drilling results were as follows:

Type of well	Number of completions			
	Petroleum	Gas	Dry	Total
1974:				
Exploration	--	1	24	25
Extension	--	1	5	6
Development	12	3	21	36
Total	12	5	50	67
1975:				
Exploration	--	2	20	22
Extension	--	1	5	6
Development	12	3	22	37
Total	12	6	47	65

Continuing the downward trend of the past 9 years, crude oil production dropped 11% in 1975. All the principal producing fields showed decreased output during the year. The mainland fields across the Straits of Magellan produced 60% of total production, and fields on Tierra del Fuego supplied the remaining 40%.

Output was expected to continue to decline until mid-1977, when the Estrecho de Magallanes Field was scheduled to start production. This could permit a progressive increase in national oil production, which is expected to reach a level of 12.6 million barrels in 1981.

Production for 1974 and 1975 was as follows, by field:

Location and field	Production (thousand 42-gallon barrels)	
	1974	1975
Mainland:		
Daniel	1,699	1,485
Daniel Este	1,529	1,261
Posesión	850	717
Cañadón	622	601
Other	1,390	1,202
Total	6,090	5,266
Tierra del Fuego:		
Calafate	1,208	1,153
Cullen	812	699
Tres Lagos	728	625
Other	1,217	1,204
Total	3,965	3,681
Grand total	10,055	8,947

Source: Empresa Nacional del Petróleo, Chile. Boletín Estadistico, 4 Trimestre y Annual, V. 70, pp. 8, 42.

Imports of crude petroleum, chiefly from Venezuela, totaled 23 million barrels, 18% less than in 1974. Imports accounted for about 70% of total petroleum refinery feedstock in 1975, compared with 75% in 1974. Concón refinery feedstock consisted of 90% foreign crude petroleum; 65% of the Concepción refinery stock was from imports. No imported crude oil was shipped to the Manatiales refinery.

Refinery output decreased 20% compared with that of 1974, owing principally to the drop in volume of imported crude oil. This reflected the low level of economic activity. The Concepción refinery processed 19 million barrels; Concón, 16 million barrels; and the Manatiales gasoline plant, 450,000 barrels.

Natural gas production remained virtually unchanged during 1975. Mainland fields accounted for over 60% of the total, and Tierra del Fuego for the remainder. The Posesión Field (mainland) remained the largest producer, supplying 38% of the total. Daniel (mainland) produced 10%, and Tres Lagos and Cullen (both on Tierra del Fuego) produced 12% and 9%, respectively. Of the total gas withdrawn from all fields, 50% was reinjected. At Posesión, 65% of the amount withdrawn was reinjected; at Daniel, 55%; at Cullen, 68%; and at Calafate, 90%.

Chile's proven natural gas reserves were estimated at 3.5 trillion cubic feet. ENAP continued plans to finance a $320-million gas-liquefaction plant at Cabo Negro in Magallanes Province. ENAP received $80 million of the required $120 million equity investment. Venezuelan investors indicated interest in the remaining $40 million. ENAP was also reported to have arranged $100 million of the $180 million to $200 million construction financing from Brazilian suppliers, and was attempting to line up the remainder through U.S., Japanese, and Swiss export guarantees.

The Mineral Industry of People's Republic of China

By K. P. Wang [1]

The economy of the People's Republic of China continued to make progress in 1975. China's gross national product (GNP) may have been approximately $260 billion to $270 billion,[2] slightly more than in 1974. Minerals, metals, and fuels made a significant contribution of between 5% and 10% to the 1975 GNP, depending on how mineral output value and value added are defined. Resources and related fields continued to be given priority in China's economic development. Large metal and equipment imports were needed to expand the production base, and these imports were primarily responsible for creating a shortage of about $1 billion in foreign exchange in 1974. To correct the shortage, the Chinese were pushing hard for exports in general and mineral-product exports in particular during 1975. The key to the balance-of-payments position was oil exports, primarily to Japan.

Early in the year, Japan was in no hurry to buy all the oil that China offered; however, it was not adverse to selling more steel and fertilizers. Near yearend, a new concept evolved; a barter of roughly 8 million tons of Chinese crude oil for 2 million tons of Japanese steel products was being considered.

Simultaneous development of both large and small industries continued to be basic policy; this is intended to localize economic strength, cut down on transportation requirements, and enable industry to better serve agriculture. Recognizing that modern technology is related to large-scale operations, the Chinese also believe that small-scale operations can be worked efficiently. The policy of "building from within," or self-reliance, was modified considerably in 1974–75; there were substantial purchases of plants, equipment, machinery, and technology. China has been arranging an increasing number of technical exchanges and trade missions, including sending a minerals and metals trade delegation to the United States in January–February 1976. On the other hand, a recently adopted industrial-planning concept of dispersing industry for strategic reasons has also been closely followed.

During the fourth National People's Congress held in late January 1975, twin long-term development goals were stated as follows: (1) Before 1980 (the last year of the fifth 5-year plan), China would establish a relatively independent and integrated industrial system; and (2) before the end of the century, China should become a totally up-to-date modern power. Mineral resources seem to be adequate for these objectives.

Premier Chou En-Lai died on January 8, 1976, and the Central Committee of the Chinese Communist Party, headed by Chairman Mao Tse-Tung, appointed Hua Kua-feng Acting Premier until the next National People's Congress is convened.

The year 1975 was one of marked growth for China's mineral industries, and the economy did reasonably well also. In particular, the petroleum industry developed rapidly in 1975, with output comparable to those of Libya and Indonesia. Less publicized were parallel developments in oil

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[2] The unit of Chinese currency is Ren-Min-Bi (RMB). The nominal exchange rate of Chinese RMB was about RMB2.2 = US$1.00.

consumption, distribution, construction of pipelines and refineries, and petrochemicals. Production and use of natural gas also increased sharply, and the Chinese were making inquiries in international markets for equipment related to liquefaction and purification of the gas. The coal industry raised output moderately, and many large and small powerplants were being built. The thrust towards increased energy use and mechanization to support agriculture became clear; China had a large coal industry long before the new surge in petroleum.

Metal imports and consumption increased sharply in 1975, primarily owing to the building of new industrial plants, pipelines, water projects, and electrification, transmission, and transportation equipment and projects. Expanding steel production did not keep pace with the even greater steel consumption, necessitating larger imports. Unlike steel, which has a reasonably good internal resource and output base, aluminum and copper shifted towards greater reliance on imports in 1975, with considerable increases in the tonnages purchased in world markets. Cement production increased significantly to meet the growing requirements of construction activities related to roads, dams, plants, and housing. In addition to raising domestic fertilizer output, there was an effort to negotiate the most favorable prices for the indispensable imports.

China's electric power capacity has grown significantly in recent years, although the total is still less than one-tenth of U.S. capacity. By yearend 1975, China's capacity probably reached 25 million to 30 million kilowatts, and hydroelectric capacity perhaps 6 million to 9 million kilowatts. The most significant aspect of the electrification program has been in the thermal area, based mainly on coal but increasingly also on oil and gas. However, many small hydroplants have been built in south and southwest China, raising the total to over 60,000 such plants by yearend. A very important recent development was the importation of gas-turbine generating units that reflect the country's emergence as a significant natural gas producer.

China has placed five satellites into the earth's orbit since 1970, the last one on December 17, 1975.[3] The fourth, launched on November 26, 1975, reportedly returned to earth as scheduled without any malfunctioning.

PRODUCTION

In 1975, China ranked within the first three world producers of bituminous coal, anthracite, tungsten, antimony, salt, pyrite, and within the first five world producers of iron ore, coke, pig iron, steel, tin, mercury, bismuth, magnesite, phosphate rock, graphite, fluorspar, asbestos, and high-grade talc and soapstone. It was also among the first 10 in crude oil, cement, manganese, barite, and rare-earth elements. In terms of combined mineral output value, China was barely among the first five. China can be expected to move up in the next decade, and it would not be surprising if the country ranked fifth or sixth in oil production by then. According to a Bureau of Mines report,[4] China is one of the world's rich mineral provinces fully capable of supporting a modern first-rank industrial economy.

China's coal industry was nearly on a par with those of the United States and the U.S.S.R. The oil industry built up three large fields, and natural gas production was greatly increased. China's steel and cement industries, although still much smaller than those of the U.S.S.R., the United States, and Japan, became comparable with those of the leading countries of the European Economic Community (EEC). The famous export metals, particularly tungsten, tin, and antimony appeared in greater quantities in the world markets during 1975.

China has been a major factor in world fertilizer output, consumption, and international trade for more than 5 years. It produced about 3 million tons of nitrogen in 1975 and consumed over 4 million tons. China continued to be Japan's largest customer for fertilizer. The country's phosphate potential became more fully exploited, but output was still less than one-tenth that of the United States, the world leader. The Chinese salt industry, based mainly upon coastal salt flats, expanded further; China already was produc-

[3] Jen-Min Jih-Pao (Peking), Dec. 18, 1975, p. 1..

[4] Wang, K. P. The People's Republic of China —A New Industrial Power With A Strong Mineral Base. BuMines SP 7–75, 1975, 96 pp.

Table 1.—People's Republic of China: Estimated production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum:			
Bauxite, gross weight [2]	[r] 760,000	[r] 970,000	970,000
Alumina, gross weight	300,000	[r] 400,000	400,000
Metal, primary, refined	150,000	[r] 150,000	160,000
Antimony, mine output, metal content	12,000	12,000	12,000
Bismuth, mine output, metal content	250	250	250
Cadmium, smelter production	100	110	110
Copper:			
Mine output, metal content	100,000	[r] 100,000	100,000
Metal, smelter	100,000	100,000	100,000
Metal, refined	120,000	[r] 150,000	150,000
Gold, mine output, metal content ---troy ounces	50,000	50,000	50,000
Iron and steel:			
Iron ore, gross weight [3] ---thousand tons	[r] 56,000	[r] 60,000	65,000
Pig iron and ferroalloys ---do	[r] 28,000	[r] 30,000	32,000
Crude steel ---do	27,000	27,000	29,000
Rolled steel	20,000	21,000	22,000
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	20,000	20,000	22,000
Smelter	[r] 22,000	20,000	22,000
Tungsten, mine output, metal content	8,000	8,500	9,000
Zinc:			
Mine output, metal content	100,000	100,000	100,000
Refined	100,000	100,000	100,000
NONMETALS			
Asbestos	[r] 210,000	[r] 150,000	150,000
Barite	165,000	[r] 200,000	250,000
Cement, hydraulic ---thousand tons	25,000	[r] 25,000	30,000
Fertilizer materials:			
Natural:			
Crude phosphate rock ---do	[r] 3,000	[r] 3,000	3,400
Potash, marketable, K_2O equivalent [4,5]	300	[r] 380	400
Manufactured, nitrogenous, N content [4,5]	2,030	[r] 2,560	2,700
Fluorspar	250,000	[r] 300,000	350,000
Graphite	30,000	[r] 40,000	50,000
Gypsum	[r] 650,000	[r] 700,000	800,000
Magnesite ---thousand tons	1,000	1,000	1,000
Pyrite, gross weight [6] ---do	2,000	2,000	2,000
Salt ---do	20,000	25,000	30,000
Sulfur:			
Native	[r] 132,000	[r] 132,000	132,000
Content of pyrite	900,000	900,000	900,000
Byproduct, all sources	120,000	120,000	120,000
Total	[r] 1,152,000	[r] 1,152,000	1,152,000
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite ---thousand tons	20,000	[r] 20,000	20,000
Bituminous and lignite ---do	[r] 400,000	[r] 430,000	450,000
Total ---do	[r] 420,000	[r] 450,000	470,000
Coke, all types ---do	28,000	28,000	28,000
Gas, natural:			
Gross production ---million cubic feet	[r] 1,100	[r] 1,400	1,600
Marketed production ---do	[r] 950	[r] 1,200	1,400
Petroleum:			
Crude (including crude from oil shale) ---thousand 42-gallon barrels	[r] 365,000	[r] 474,500	571,590
Refinery products ---do	[r] 325,000	[r] 422,000	509,000

[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] Diaporic bauxite; includes an estimated 160,000 long tons annually of production for refractory applications.

[3] In terms of 50% Fe ore.

[4] Data are for year ended June 30 of that stated.

[5] Source: British Sulphur Corp. Ltd. Statistical Supplement No. 12, November-December 1975, pp. 15, 19.

[6] Sulfur content of pyrite has been listed under sulfur.

ing at more than one-half the U.S. level. China remained prominent in pyrite. Manchuria is one of the world's best known areas for magnesite, both in terms of potential and production. China improved its position as a medium-sized producer of asbestos, graphite, barite, and fluorspar. Chinese steatite-grade talc is well known in world markets.

TRADE

Total trade of the People's Republic of China was about $14 billion in 1974, with exports of $6.5 billion and imports of $7.5 billion. Overall 1975 trade was slightly higher, and the gap between exports and imports was smaller. However, China has sharply reduced imports in some areas, especially agricultural products and complete industrial plants. China exported possibly 10 million tons of crude oil in 1975 and imported nearly 5 million tons of finished steel products. Japan has been China's leading trading partner, importing $1.5 billion and exporting $2.3 billion in goods in 1975. China's crude oil exports to Japan were worth possibly $600 million, and steel imports from Japan were worth about $1 billion. Most of the remainder of the trade was with Western Europe and North America. Two-way trade with the United States in 1975 may be only $450 million—less than one-half the total trade in 1974. Trade with Eastern Europe had been small for many years, although China has sold significant tonnages of its famous export metals (particularly tungsten) to the U.S.S.R. in recent years. Trade with Far East countries, Oceania, and Latin America has been on the rise.

Minerals, metals, fuels, chemicals, fertilizers, mineral-related products, and equipment and plants for mineral and metal development, extraction, and processing were very important components of China's overall trade. Detailed data on trade are not available, so individual items of imports and exports must be estimated. Out of the roughly $6.5 million in goods exported in 1974, $550 million can be attributed to oil, $150 million to "export metals", and $10 to $15 million each to salt, fluorspar, coal, talc, and magnesia and other nonmetallics. Out of the approximately $7.5 billion of goods imported by China in 1974, $1.3 billion might be attributed to complete industrial plants; $900 million to steel products; $400 million to fertilizers and raw materials; $250 million to metals; $200 million to pig iron, scrap, and other ferrous materials; and possibly $200 million (order of magnitude) to mineral-industry-related machinery and equipment.

Partly because of the effort to avoid recurrence of the balance-of-payments deficit, the purchase of complete industrial plants in 1975 was cut nearly $1 billion compared with that of 1974. Steel imports were up at least $300 million, and machinery and equipment purchases were about the same as 1974 levels. As an order of magnitude of steel imports, China contracted to buy 2.3 million tons of steel products from Japan (by far the largest supplier) for the second half of 1975. Trade circles have reported that China bought well over 300,000 tons and possibly as much as 350,000 tons of aluminum from abroad during 1975. Imports of copper, lead, and zinc have been sizable also. Recently, China has contracted to buy moderate quantities of copper concentrates and high-grade iron ore.

Table 2.—People's Republic of China: Apparent exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite and concentrate	99,913	111,178	Canada 34,427; France 17,531; West Germany 16,076.
Oxide and hydroxide	5,999	2,250	All to Finland.
Metal including alloys, all forms	--	223	All to Belgium-Luxembourg.
Antimony:			
Ore and concentrate	8	17	All to Zambia.
Metal including alloys, all forms	250	100	All to U.S.S.R.
Arsenic oxide and acids	1,266	969	Japan 575; Italy 304.
Chromium oxide and hydroxide	--	247	Austria 116; Finland 45; Australia 35.
Copper metal including alloys, all forms	100	NA	
Iron and steel:			
Ore and concentrate	--	514	All to West Germany.
Metal:			
Scrap	--	102	Do.
Pig iron, ferroalloys, similar materials	--	560	Mainly to Sweden.
Semimanufactures:			
Wire	--	610	United States 450; West Germany 94; United Kingdom 66.
Tubes, pipes, fittings	(2)	712	Mainly to Japan.
Lead metal including alloys, all forms	--	58	Japan 50; Zambia 8.
Manganese:			
Ore and concentrate	47,750	61,273	Mainly to Japan.
Oxide and hydroxide	--	1,812	Sweden 1,422; Norway 330.
Mercury ... 76-pound flasks	1,973	4,351	France 1,131; West Germany 1,015; United Kingdom 841.
Tin metal including alloys, all forms:			
Scrap	--	20	All to United Kingdom.
Unwrought	8,153	9,159	United States 3,336; Netherlands 1,461; France 1,280.
Titanium oxides	625	490	All to Japan.
Tungsten ore and concentrate	9,997	8,073	U.S.S.R. 3,900.
Zinc:			
Oxide and hydroxide	--	30	All to Japan.
Metal including alloys, all forms	--	495	Sweden 295; Portugal 150; Netherlands 50.
Other:			
Ore and concentrate, n.e.s.[3]	3,099	5,736	Japan 1,994; France 1,586; Greece 803.
Oxides, hydroxides, peroxides of metals, n.e.s	[4] 445	[4] 682	Sweden 139; West Germany 137; Italy 90.
Metalloids	--	[4] 46	All to Japan.
Nonferrous metals including alloys, all forms	[4] 3,089	[4] 1,255	Japan 509; France 415; West Germany 143.
NONMETALS			
Abrasives, natural, n.e.s. value, thousands	$548	$333	Japan $175; Belgium-Luxembourg $144.
Asbestos	--	1,394	All to Japan.
Barite and witherite	61,828	[4] 100,759	France 46,773; Japan 35,576.
Boron materials, oxide and acid	--	40	All to West Germany.
Clays and clay products:			
Crude clays, n.e.s	23,939	112,909	Mainly to Japan.
Products:			
Refractory	--	4,804	All to Japan.
Nonrefractory ... value, thousands	--	$30	NA.
Cryolite and chiolite	--	1,197	All to United States.
Diamond:			
Gem not set or strung value, thousands	$1,243	$233	Japan $169; Belgium-Luxembourg $37; Switzerland $25.
Industrial ... do	$497	$144	All to Belgium-Luxembourg.
Feldspar and fluorspar:			
Fluorspar	60,757	102,985	U.S.S.R. 84,840; Czechoslovakia 18,145.
Undifferentiated	174,979	210,752	Mainly to Japan.
Fertilizer materials: Crude, phosphatic	200	860	All to Zambia.
Graphite, natural	8,954	11,936	West Germany 4,730; France 2,535, United Kingdom 1,253.
Magnesite	19,782	62,113	Japan 24,331; West Germany 15,196; United Kingdom 9,811.

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	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Mica, crude	1,250	4,414	United Kingdom 2,149; West Germany 1,195; Netherlands 500.
Pigments, iron oxides	--	855	Denmark 430; Australia 295; Finland 106.
Precious and semiprecious stones except diamond ____value, thousands	$3,927	$2,325	Japan $1,516; United States $520.
Salt ____thousand tons	[r] [4] 99	[4] 101	U.S.S.R. 101.
Sodium and potassium compounds:			
Caustic soda	265	400	All to Japan.
Soda ash	--	120	All to Finland.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	6,351	10,813	Do.
Worked	[4] 4,433	[4] 3,668	Mainly to Japan.
Gravel and crushed rock	10,020	4,843	Do.
Quartz and quartzite	13,638	22,601	All to Japan.
Sand, excluding metal bearing	10,815	9,443	Do.
Talc, steatite, soapstone, pyrophyllite	195,201	230,154	Mainly to Japan.
Other nonmetals, n.e.s.:			
Crude	3,807	3,701	Spain 863; Australia 659; West Germany 596.
Slag dross and similar waste, not metal bearing from iron and steel manufacture	11,300	9,003	All to Japan.
Oxides and hydroxides of magnesium, strontium, barium	2,025	2,732	Mainly to Finland.
MINERAL FUELS AND RELATED MATERIALS			
Coal	293,622	405,127	All to Japan.
Petroleum:			
Crude and partly refined ____thousand 42-gallon barrels	NA	28,455	Do.
Refinery products:			
Lubricants ____value, thousands	--	$207	Japan $102; Australia $100.
Other:			
Mineral waxes ____thousand 42-gallon barrels	124	286	Italy 84; Australia 52.
Petroleum coke ____do	--	391	All to Japan.

[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] Source does not give details on metals included in this category but presumably the figure consists chiefly of antimony, bismuth, and molybdenum.

[4] Partial figure; tonnage not available for all destinations.

Source: For Poland, the U.S.S.R., Czechoslavakia, and Zambia—official import statistics of the respective country; for all other countries—Statistical Office of the United Nations, 1973 edition of the World Trade Annual, vs. 1, 2, and 3, Walker and Co., New York, 1975, and the 1974 Supplement to the World Trade Annual, v. 5 (Far East), Walker and Co., New York, 1976, pp. 141–164.

Table 3.—People's Republic of China: Apparent imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Oxide and hydroxide	466	440	Mainly from Japan.
Metal including alloys:			
Unwrought	72,430	24,828	Japan 5,694; West Germany 5,512; France 5,000.
Semimanufactures	943	1,167	Mainly from Japan.
Cobalt metal, unwrought	200	--	
Copper:			
Metal including alloys, all forms	65,204	63,433	Japan 34,291; Yugoslavia 14,985; Canada 8,686.
Iron and steel:			
Ore and concentrate ..thousand tons..	NA	1,581	All from Australia.
Scrap ..do..	518	173	All from United States.
Pig iron, ferroalloys, similar materials ..do..	756	692	Australia 364; Yugoslavia 129; West Germany 121.
Steel primary forms ..do..	233	416	Mainly from Japan.
Semimanufactures:			
Bars, rods, angles, shapes, sections ..do..	[2] 613	590	Do.
Universals, plates, sheets [2] ..do..	1,838	1,637	Japan 1,414; West Germany 182.
Hoop and strip ..do..	113	163	Japan 86; West Germany 49.
Rails and accessories ..do..	20	1	All from Japan.
Wire ..do..	21	19	Japan 10; West Germany 4; Sweden 2.
Tubes, pipes, fittings ..do..	673	[2] 602	Japan 390; West Germany 190.
Castings and forgings, rough ..do..	([3])	([3])	
Total ..do..	3,278	3,012	
Lead:			
Oxide and hydroxide ..value, thousands..	--	$267	All from Australia.
Metal including alloys, unwrought	10,023	3,097	Mainly from Japan.
Magnesium metal including alloys, unwrought	--	51	All from West Germany.
Manganese oxides	800	782	All from Japan.
Molybdenum metal including alloys, all forms	1	--	
Nickel metal including alloys, all forms	23,302	[2] 21,725	Mainly from Canada.
Platinum-group metals including alloys, all forms ..value, thousands..	$15,608	$3,558	United Kingdom $2,432; Japan $713; United States $413.
Silver metal including alloys ..do..	$4,916	$245	Mainly from West Germany.
Tantalum metal including alloys, all forms	--	1	All from Japan.
Tin:			
Ore and concentrate	--	104	All from United Kingdom.
Oxide	--	6	All from West Germany.
Titanium oxides	1,923	1,620	Japan 715; West Germany 435; Belgium-Luxembourg 400.
Tungsten metal including alloys, all forms	9	13	All from Japan.
Zinc metal including alloys, all forms	204	375	Australia 305; Belgium-Luxembourg 70.
Other metals including alloys, all forms:			
Base metals, n.e.s	379	514	Mainly from Belgium-Luxembourg.
NONMETALS			
Abrasives, natural, n.e.s., grinding and polishing wheels and stones	--	3	All from Switzerland.
Asbestos, crude	179	NA	
Clay products:			
Refractory	--	[2] 2,600	Mainly from Japan.
Nonrefractory	--	108	All from Italy.
Diamond:			
Gem, not set or strung ..value, thousands..	$13,729	$3,500	Mainly from United Kingdom.
Industrial ..do..	$1,118	$262	Mainly from Belgium-Luxembourg.
Fertilizer materials:			
Crude, phosphatic	36,792	40,373	All from United States.
Manufactured:			
Nitrogenous ..thousand tons..	2,460	208	Netherlands 66; Belgium-Luxembourg 65; West Germany 39.

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	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured—Continued			
Phospatic _______thousand tons__	82	--	
Potassic __________________do____	77	214	Mainly from Canada.
Other including mixed ____do____	109	73	Mainly from West Germany.
Mica, worked ______________________	--	7	All from United Kingdom.
Precious and semiprecious stones, except diamond, natural ___value, thousands__	--	$503	Mainly from United Kingdom.
Soduim and potassium compounds, n.e.s.:			
Caustic potash, sodic and potassic peroxides _______________________	5,245	2,470	Japan 1,240; Italy 1,000.
Soda ash _______________________	--	2,000	All from Japan.
Sulfur, all forms __________________	r 420,000	300,000	NA.
Other nonmetals, n.e.s., halogens (excluding chlorine) __________________	29	81	United Kingdom 63; Japan 18.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black _______________________	852	700	All from Japan.
Petroleum refinery products:			
Lubricants thousand 42-gallon barrels__	[2] 3	[2] 2	Italy 1; Netherlands 109.
Distillate fuel oil ____________do____	--	18	All from Yugoslavia.
Residual fuel oil ______________do____	--	25	Do.
Mineral jelly and wax ________do____	--	2	Mainly from West Germany.
Mineral tar and other coal–, petroleum–, or gas-derived crude chemicals ________	12,016	11,101	Do.

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] Partial figure; tonnage not available for all destinations.

[3] Less than ½ unit.

Source: For Poland and the U.S.S.R.—official export statistics of the respective country; for all countries—Statistical Office of the United Nations, 1973 edition of the World Trade Annual, vs. 1, 2, and 3, Walker and Co., New York, 1975, and the 1974 Supplement to the World Trade Annual, v. 5, (Far East), Walker and Co., New York 1976, pp. 165–179.

COMMODITY REVIEW

METALS

Aluminum.—Expansion of power generation and transmission facilities has greatly increased demand for aluminum in China. The country apparently entered the takeoff stage in aluminum consumption, spurred by rapid growth in oil and gas production and consumption. Meanwhile, China has not built any large aluminum-reduction facilities since completing the 100,000-ton-per-year Fushun plant in Liaoning Province during the mid-1950's, and the country faces obviously increasing shortages. This situation is in contrast with the rest of the world, where many large new aluminum plants have been constructed, mostly by international companies. Lack of adequate cheap power, high-grade resources, easily available capital, and the latest technology, plus difficulty in establishing big integrated projects, are among the reasons China has not moved forward rapidly in this area. Nonetheless, China probably produced about 200,000 tons of aluminum annually during 1974–75.

Recent information indicates that the Fushun plant has horizontal-stud Soderberg cells that produce 450 kilograms per day per cell. There are two units, each with two potlines of 160 cells per line, or a total of 640 cells. Fushun uses acidspar from Taolin. China's foremost alumina plant, Nanting in Changtien (Shantung Province), with four large rotary kilns and corresponding chemical facilities, has been steadily expanded in the last few years. Reduction plants of 20,000- to 30,000-ton initial capacity apparently have been built at the Sanmen Gorge at the Honan-Shansi border and at Lanchow, Kansu Province. Unconfirmed small plants might also have been built at Taiyuan (Shansi), Wuhan (Hüpeh), Changling (Kirin), Tsingtao (Shantung), Nanning (Kwangsi), Hofei (Anhwei), Sian (Shensi), Kweiyang (Kweichow), Chiaotso (Honan), and Changsha (Hunan). Completion of an aluminum plant with two potlines was mentioned late in the year for Yiliang County, southeast of Kunming, in Yunnan Province. One might assume that at least one-half of these small plants are in operation. Thus, the overall aluminum-reduction capacity has been raised to well over 200,000 tons per year.

Meanwhile, China had quietly imported an average of nearly 100,000 tons of aluminum annually during 1972–74. In 1975, the combined tonnage purchased by China from several international aluminum companies may have reached 350,000 tons. This reflects not only spiraling demand, but perhaps also buying at reasonable prices beyond what is immediately needed as a hedge against higher prices.

Antimony.—The most elusive of China's big three export metals, antimony, is used in batteries, bearings, type metal, solder, and munitions, and the sulfide (crude antimony) and oxide (antimony white) are used mainly in flameproofing, pigments, and ceramics. China was competing primarily with the Republic of South Africa (ores have gold) and Bolivia in world markets. The three countries had a "summit" meeting in La Paz late in 1975, but China pulled out midway, possibly because of nonrecognition by Bolivia. Nonetheless, a Bolivian antimony delegation visited China subsequently to discuss areas of further cooperation.

Chinese antimony consumption may have reached 5,000 tons during 1975, and accountable exports through statistics of importing countries have averaged nearly 7,000 tons annually in recent years. China had antimony to sell in 1975, but could not get good prices. Stockpiles are probably considerable. Output in 1975 is estimated at 12,000 tons valued at approximately $35 million. Both the regulus and antimony white are 99.5% pure, and antimony concentrates can be 25% to 60% Sb. Most Chinese antimony comes from southwest Hunan Province, mainly from Hsikwangshan, which may have reserves of 1.5 million tons of antimony. Output can be easily increased, and the Chinese industry is well acquainted with antimony technology.

Bismuth.—China continued to produce about 5% to 10% of the world's output, ranking about fifth. Little has been exported, indicating a growth in domestic consumption and possible stockpiling. Chinese bismuth is a byproduct of the tungsten from Kiangsi Province and nonferrous operations.

Copper.—Chinese consumption of copper may well have reached 300,000 tons in 1975, which is of some consequence by world standards. Electric power and machinery requirements have steadily expanded, and military-security needs for copper were also of consequence. International tension along the Chinese borders has also made it imperative to build up national stockpiles. As with aluminum, domestic production remained relatively small. Moreover, the country still did not have even one large copper mine or plant. However, some secondary materials were available, including brass, bronze, and plain copper scrap. China has had to rely heavily on imports, and this situation will continue until large integrated domestic projects, including smelters, can be developed. Copper production from domestic materials is estimated at 150,000 tons in 1975, not including refined copper made from imported blister copper.

As of 1975, China seems to have up to 10 copper mines producing between 2,000 and 20,000 tons per year of mine copper; included are Hungtoushan near Fushun, Huatung at Chingyuan in Liaoning Province, Tunghua in Kirin Province, and Tungkuanshan in Anhewei Province. More important is the potential for porphyry copper in, for example, the Chilienshan Mountains of Kansu Province and the Chungtiaoshan Mountains of Shansi Province. The Chinese seem to have difficulty developing large deposits, although it started to inquire about excavating equipment in 1974–75.

Except for Shenyang and Shanghai, information on Chinese copper smelting and processing facilities remained meager. The Shenyang smelter produces refined lead and zinc in addition to several tens of thousands of tons of refined copper; the raw material is mostly primary. The Shanghai copper and lead refineries may produce slightly more copper than Shengyang, but most raw materials consist of imported blister copper and scrap. Copper refineries have also been mentioned for Taiyuan and Chungtiaoshan in Shansi Province, Tayeh and Wuhan in Hupeh Province, Kunming in Yunnan Province, Anhwei Province, Fukien Province, and Hainan Island. There is said to be a large smelting center at Lanchow in Kansu Province, which probably produces copper among other metals, including byproduct rare-earth metals. Another "complex" smelter has been mentioned as being located in Urumchi, Sinkiang. The Chinese talked with the Japanese about building a copper smelter during 1975 and earlier, including Furukawa Mining Company about flash smelters.

China has a long-term contract with Zambia for copper as collateral for a $400 million interest-free loan to build a 2,000-kilometer railroad linking Zambia with Tanzania. Shipments from Zambia were 18,000 tons in 1974 compared with 44,000 tons in 1971. Chile furnished China with 40,000 to 60,000 tons annually in recent years. Peru's yearly shipments have been about 25,000 to 30,000 tons to repay a loan to develop the Tintaya copper deposit in Peru. Japan, Canada, and the United Kingdom have also sold China large tonnages of copper. All told, Chinese imports have hovered between 100,000 and 170,000 tons yearly. In 1975, China began receiving trial shipments of copper concentrates from the Philippines and Bougainville amounting to 10,000 to 15,000 tons in each case.

Iron and Steel.—The year was hardly impressive for the iron and steel industry in terms of achieving long-term objectives. No specific national output data and few plan-fulfillment figures for individual steel complexes or sectors were announced. Most of the activity was in the areas of basic construction, plant consolidation, and upgrading of raw materials. Although probably much below the original targets of the fourth 5-year plan, the Chinese steel industry made some gain in 1975, possibly producing about 29 million tons of crude steel.

Chinese policy apparently was aimed at increasing the size of existing large steelworks, with special emphasis on Wuhan, where newly purchased foreign rolling mills were being installed. Construction of additional integrated steelworks was not yet started. Meanwhile, effort was made to use more and larger oxygen converters, along with electric furnaces, while improving operations of existing open hearths. The iron-ore and coking-coal supply problems seems to have been solved, with good-quality materials now being charged to the blast furnaces. Medium-sized and local steelworks were also being expanded.

China was running into trouble trying to meet its short-term goals. Chinese capital and technology have not been adequate for boosting steel output to a new plateau. There was also concern that too much foreign exchange would be needed to purchase plants from abroad. The principal deals so far arranged pertain mainly to steel rolling mills and fabrication plants rather than basic steelmaking facilities. Recent developments indicate that the Chinese would be able to raise steel capacity only by about 10 million to 12 million tons in the next 5 years. Meanwhile, demand continued to increase sharply. Some Chinese planners feel that monies spent on imports of metal products might be better diverted to the purchase of capital equipment. In any case, a strong investment push in China's iron and steel industry to simultaneously produce as much basic equipment as possible and to import what is absolutely needed became a likely development. China imported about 3.0 million tons of finished steel products in 1974 and considerably more in 1975.

The Chinese started to look into the matter of compensating for its extensive but generally low-grade iron ores. Steps were taken to sweeten indigenous concentrates with very high-grade imports. A contract was made with the Hammersley Enterprise in Australia, and 1.6 million tons of iron ore were actually imported from that source in 1974. Trial shipments from Brazil's Companhia Vale do Rio Doce were also arranged in 1975. Of late, there has been much more news on the testing, washing, and availability of coking coal (see "Coal" section). Scrap iron was and will be in short supply, since recycled scrap is only about one-fourth of steel-ingot output, and collected scrap is no more than 5 million to 10 million tons yearly. China has been importing nearly 2 million tons combined pig iron and scrap annually in recent years.

Anshan overshadows all other Chinese steel plants. This integrated steelworks has had a turbulent history; built by the Japanese, it was stripped by the Soviets just after World War II, rebuilt and substantially expanded in the fifties with Soviet help, and seriously disrupted during the Cultural Revolution. It started to recover in 1968,–71, and the last and biggest blast furnace (11th, Chinese-built, and probably 2,000 cubic meters in size) was added in 1972. The main thrust in the last few years has been the installation of two large basic oxygen furnaces (BOF's) and corresponding oxygen generators, various mines and sintering and beneficiation plants, and blooming and finishing mills of various types, including plate, hot-strip, rail, and pipe and tubing mills. Steel-ingot capacity at yearend 1975 was approximately 7 million tons. Claims for Anshan in 1975 include additions in processing capacity, greater diversity of products, and significant output gains in the last 2 months.[5]

Wuhan steelworks finished its first two blast furnaces by 1960, along with five large open-hearth furnaces, all built with Soviet help. Little happened immediately after the Soviet technicians left, and it was not until 1969 and 1971 that the last two blast furnaces were finally built (the largest with a capacity of 2,000 cubic meters). Additionally, one more large open hearth, three byproduct coke ovens, a sintering plant, and various mills (including a heavy mill for rails and beams) were installed. The iron ore base was stabilized in 1975, with development of the necessary mines. Steel-ingot capacity may be as high as 3 million tons per year. Wuhan was scheduled to be the recipient of a 3-million-ton hot-strip mill, a 70,000-ton Sendzimer mill, and a 1-million-ton cold-strip mill from abroad. In due time, BOF's will probably be installed in this steelworks also. Generally, Wuhan did well in 1974–75.

The Peking steelworks, with the installation of the fourth and largest blast furnace (possibly 1,200 cubic meters), and having suitable iron mines, a sintering plant, a modern coke plant, three oxygen plants and BOF's, and at least one blooming mill, billet mill, and bar mill, has become integrated at about 1.5 million tons of annual ingot capacity. The Peking steelworks claimed that it surpassed its targets in 1975. Shanghai has eight small steel plants, aggregating perhaps 3 million tons in ingot capacity plus corresponding rolling and fabricating capacity. Combined capacity was said to have been raised 1 million tons during 1971–75. China expanded various other lesser steelworks to some degree, but the main effort in 1975 seems to be in the building up of 10 to 20 plants with capacities of less than 500,000 tons per year.

Lead and Zinc.—China's lead and zinc supply remained unsatisfactory in 1975 in the face of sharply growing demand. As more vehicles are used and additional electric power is generated as a result of the expanding oil and gas output, increasing quantities of lead will be needed for batteries and cables. More zinc will also be needed for galvanizing and plating. China may have produced 100,000 tons per year each of lead and zinc during 1974–75. Recent imports have been 20,000 to 40,000 tons of lead and less than 10,000 tons of zinc (20,000 to 25,000 tons in 1970–71). Peru, North Korea, Western Europe, and Japan have sold the most lead and zinc to China in 1973–75. Little new information has come to light on lead-zinc facilities, particularly new mines. Shenyang and Shanghai remained as the two known leading smelters, since there is no confirmation on the Shaokuan smelter using the Imperial Smelting Process in Kwangtung Province. Surprisingly, it was rumored that the Chinese had offered to sell some zinc on the London Metal Exchange early in 1975. This may mean that the zinc deficiency is improving.

Magnesium.—China imported 3,000 to 5,000 tons of magnesium metal annually in 1972–75, possibly more than one-half from Norway. There must be increasing need for this metal in aluminum-base alloys, and it is possible that titanium, which needs magnesium for its manufacture, is being produced.

Nickel.—Like chrome, domestic resources of nickel seem lacking. Thus, nearly 30,000 tons of nickel have had to be imported annually for industrial and steelmaking requirements. Cuba and the U.S.S.R. had been supplying China with moderate quantities of nickel. The Philippines and Indonesia plan to sell nickel to China. However, the principal recent supplier has been Canada (International Nickel Co. of Canada, Ltd., and Falconbridge Nickel Mines, Ltd.), which furnished more than 60,000 tons to China during 1973–75.

Rare Metals.—According to a publication,[6] China has the technology of separat-

[5] New China News Agency (Peking). Mar. 17, 1976.

[6] China's Foreign Trade (Peking). January 1976, No. 1, p. 8.

ing, melting, and processing more than 40 rare metals. Output reportedly is increasing and provides quality material for China's ferrous and nonferrous metals, nuclear energy, chemical, electrical, electron-tube making, and semiconductor industries, as well as for advanced scientific and technological research.

China has also transformed itself from an importer of some rare metals into a major exporter. A wide variety of exotic metals and minerals are now available for export, including high-melting-point metals, rare-earth metals, rare light and precious metals, high-purity metals, semiconductor materials, various alloys and metallic compounds, and other rare mineral products.

Apparently, China has abundant columbium resources (associated with tantalum) and is producing columbium powder, bars, ingots, and oxide on a considerable scale for use in steel metallurgy, electronics, optical glasses, chemicals, and especially superconductors. China also produces and exports beryllium-copper alloys, ferrotungsten, ferrophosphorus, other ferroalloys, and electrolytic manganese. As described later (see "tungsten" section), China makes high-quality tungsten powder and bars.

A fairly comprehensive and expanding high-purity-metals, industry has been developed; this industry is necessary for producing electronics, semiconductors, and special instruments and detectors. Tellurium, arsenic, cadmium, and gallium are produced in 99.9999% pure quality. Many more metals are produced in 99.999% quality, including copper, lead, zinc, tin, bismuth, cadmium, antimony, gallium, nickel, phosphorus, sulfur, boron, arsenic and tellurium. Lithium for atomic energy and advanced technology is produced in 99.99% grade.

The Chinese make precision alloy products and seven types have been offered for export: Soft magnetic alloys deformable permanent magnets, elastic alloys, expansion alloys, thermostatic bimetals, cast alnico permanent magnets, and cold-rolled silicon steel strips.

Chinese claim to have the largest reserves of rare earths in the world,[7] and the deposits are widely distributed. Begun in 1958, the Chinese rare-earth industry reportedly produced five times more (probably measured in value) in 1974 than it did in 1965, with surpluses to export. The materials involved are mainly oxides of lutetium, praseodymium, neodymium, yttrium, dysprosium, erbium, ytterbium, gadolinium, and holmium (17 elements in all). In addition to production, Chinese scientists have done important research and development work in line with available resources. A National Rare Earth Conference was convened in Paotou during 1975. A special Rare Earths Institute was formed in Lanchow, Kansu Province, during the spring of 1975 to develop a rare earth and chloride production system.

Aside from exporting rare-earth metals and compounds, China also sells concentrates such as xenotime, columbite, zircon, lithium mica, spodumene, single silicon crystal, and natural and synthetic quartz crystals. The best columbite is better than 60% in grade and contains impurities of less than 6% TiO_2, 7% SiO_2, and 5% WO_3. Columbite is the source of columbium, tantalum, and their oxides. The highest grade of zircon concentrate is better than 65% and contains less than 0.3% TiO_2 and 0.2% Fe_2O_3. Zircon, the main source of zirconium and hafnium, is used in China in nuclear energy, metallurgy, casting, refractories, glasses, and the making of special-quality alloys.

Tin.—China produced roughly 20,000 metric tons of tin annually in recent years, and probably could expand output considerably at Kuchiu in Yunnan Province, Fuhochung and Chimou in Kwangsi Province, and elsewhere. The Chinese industry produces fairly good tin ingot from Kuchiu ores and excellent high-purity tin from placer operations in Kwangsi. Tin consumption in China may have reached 8,000 to 9,000 tons whereas exports were over 15,000 tons in 1975. The United States took about 6,330 tons of Chinese tin, worth nearly $40 million, in 1975 compared with 3,336 tons in 1974, 1,755 tons in 1973, and 163 tons in 1972. During 1972–74, France imported an average of about 1,500 tons per year of Chinese tin; Netherlands, roughly 1,200 tons; West Germany, Japan, and the U.S.S.R., 600 to 750 tons each; and Italy, Canada, and Poland, 350 to 500 tons each.

China is not a member of the International Tin Council (ITC). Its tin sales are outside of the quota established by the

[7] Jen-min Jih-pao (Peking). Oct. 10, 1975, p. 4.

ITC, do not meet with ITC approval, and probably have had a depressing effect on prices. However, China apparently did not intend to disrupt the world market flow, and there were subsequent indications that its annual tin exports would revert back to the 1973–74 level of about 10,000 tons. China no doubt has sizable stockpiles of tin (probably at least 50,000 tons) for strategic and trading purposes.

Tungsten.—China has extensive tungsten resources, possibly 100 million tons of 1.5% to 2.5% WO_3 ore. Production has never been reported, but may amount to 15,000 to 20,000 tons per year of 65% WO_3 concentrate. Consumption has grown to 6,000 to 7,000 tons, mainly because of expanded use of drill bits and machine tools. Recent exports have consistently exceeded 11,000 to 12,500 tons annually, valued at $65 million to $75 million at yearend 1975 prices. Historically, yearly exports have often been in the 15,000- to 20,000-ton range, and were close to 30,000 tons in 1957. Most exported tungsten has gone to Western Europe (led by West Germany), Eastern Europe, and the U.S.S.R. Wolframite from the Tayu District, Kiangsi Province, has long been world famous, and there are good wolframite deposits in Kwangtung Province (at Shihjenchang, Yangchiang, and Yaoling) and scheelite deposits in Hunan Province (Yangchiatan). The potential for greater output is excellent. China attended recent meetings of the United Nations Conference on Trade and Development (UNCTAD) and the Primary Tungsten Association (both partially aimed at world price stabilization), but as yet has revealed little information on its tungsten situation.

China is well versed in tungsten technology. Metallic tungsten is made from ammonium paratungstate, which in turn is derived from selected tungsten concentrates. Tungsten powder, bars, wire, and rolled material are available for both domestic use and exports. A very high-quality material of up to 99.9% purity, and a second-grade material of up to 99% purity, have been offered in world markets.

Uranium.—China apparently produced uranium ore from Maoshan and Chushan in Chuannan County of Kiangsi Province and Hsiachuang in Weiyuan County of Kwangtung Province, among other places. Western knowledge of Chinese uranium ore sources is scanty and outdated. However, it is likely that China can delineate adequate resources to support a substantial nuclear power industry. There is a beneficiation plant at Chuchou, Hunan Province, and a gaseous diffusion plant at Lanchow in Kansu Province. Recently, Gabon offered to sell China some uranium ore.

China exploded its 17th nuclear device underground on October 27, 1975. The 16th explosion (200 kilotons to 1 megaton in size) was made on June 17, 1974, near Lop Nor, Sinkiang Province, where virtually all the earlier ones were tested.[8] Most of the recent tests were of fusion (hydrogen) devices, and several were 3 megatons in size. The fissionable material used recently was apparently uranium-235 rather than plutonium.

Czech scientists who have assisted Chinese scientists in treating uranium raw materials believe that nuclear research in China has attained world levels and that a production process for the hydrogen bomb was being worked out as early as 1966. Apparently, Chinese scientists started to use lithium-7 recently to produce a thermonuclear fuel for detonating atomic bombs, which in turn create the deuterium and tritium necessary for thermonuclear reaction. Generation of nuclear electricity is of increasing interest; delegates of such background were included in survey missions dispatched to Japan and Canada during 1972–73. Late in 1975, a delegation from the 12-nation European Organization for Nuclear Research visited China and noted that controlled thermonuclear fusion and reactor technology were up-to-date, but Chinese scientists were nevertheless anxious to obtain scientific and technical help from Western scientists.

NONMETALS

Asbestos.—China has become a medium-sized world producer of asbestos, with 1975 output at possibly 150,000 tons. The most famous deposit is still Shihmien (meaning asbestos in Chinese) in Szechuan Province.[9] Its overall ore zone was described as 6,300 meters long and 350 meters wide, with reserves of about 28 million tons of plus 2% ore. Shihmien's chrysotile fibers of 2 centimeters or better represent more than one-half the total produced. There are

[8] Far Eastern Economic Review (Hong Kong). May 6, 1974, p. 34.
[9] Takungpao (Peking). Aug. 31, 1974, p. 8.

over 12 fairly up-to-date projects at Shihmien, including a good beneficiation mill, powerplant, and aerial tramway. Szechuan has a second major asbestos deposit called Penghsien, fairly close to Shihmien and not well known.

Outside of Szechuan, probably the asbestos deposits of Laiyuan County, Hopeh, are the most productive. The ore body embraces 5 to 20 veins (1 to several meters wide) that extend several kilometers in length. The chrysotile asbestos of Laiyuan is 2 to 5 centimeters long, high in tensile strength, and suitable for high-quality products. Asbestos has also been discovered in Yuankiang County, Yunnan Province.

Small quantities of Chinese asbestos have reached outside markets. Japan imported 1,394 tons in 1974 and 1,200 tons in 1975. Poland has bought some Chinese asbestos, and Mexico recently purchased some of fair quality. Apparently China does not have much asbestos to sell or is not pushing exports. Some asbestos products are offered in world markets.

Barite.—Chinese barite is coming to the forefront of mineral activity, in view of the growing domestic market created by extensive drilling for oil and gas. Output in 1975 is estimated at possibly 250,000 tons and rising. Exports were 75,000 tons or more in 1972 and 1973, and as much as 125,000 tons in 1974 (France took nearly 47,000 tons and Japan, just under 36,000 tons). A recent offer to sell large tonnages of Chinese barite is said to have been made in U.S. trade circles. Chinese barite comes in three grades—90%, 95%, and 97% $BaSO_4$.

China seems to have extensive barite resources, although current production areas are not known. Old deposits include Tangshan in Hopeh, Hwashan in Shantung, Hsuijen in Kwangsi, and Linchuan in Kiangsi. All barite deposits mentioned hitherto seem to have been high-quality, easy-to-work ore bodies, with implications of initial reserves at million of tons.

Cement.—The Chinese cement industry has become a world factor. Output is estimated at more than 30 million tons in 1975, which is close to that of leading Western European countries, and it continues to rise. Over one-half of the cement produced in 1975 (reportedly 57%) was credited to small cement plants. These small cement plants reportedly fulfilled the 1975 target 2 months ahead of schedule, with an output increase of more than 30% over the same 10-month period in 1974.[10]

As of yearend 1975, China had at least 30 large cement plants capable of producing more than 200,000 tons per year. There were probably 30 more in the 100,000- to 200,000-ton range. Four large plants are rated at 1 million tons or more, namely Hantan in Hopeh, Yao Hsien in Shensi, Huahsin in Hupeh, and Liuliho in Peking. The last-named plant joined the ranks in mid-1975 when a kiln with a capacity of over 300,000 tons was completed. Annual capacity of the old Harbin plant of only 100,000 tons was raised to 350,000 tons in recent years. It seems that Kwangchow (or Canton) has a second large plant called Chihni of 350,000 tons to complement a 700,000-ton plant built earlier at a different location. A large plant may have been built in Hunan Province, which has about 200 small plants. Most large plants employ the dry-process and LePaul type of rotary kilns. Their capacities probably can be increased considerably, if a suspension preheater system is introduced. The Chinese have been building 300,000-ton rotary kilns at the Lanchow Petrochemical Machinery plant for about 5 years.

There must have been about 3,000 small cement plants in existence throughout China at yearend 1975. One common category is the 3,000- to 7,000-ton capacity and a second, 10,000 to 50,000 tons. The smaller ones are generally batch, coal-fired, vertical kilns; slightly larger ones employ continuous operations with varied fuels and either vertical or horizontal kilns. Although some inefficient small cement plants may have been discarded, many others have been enlarged by adding new devices for improving mechanization, heating, and blowing. Over 80% of the Chinese counties now have small cement plants to support local agriculture and industry.

Fertilizer Materials.—Chinese probably produced approximately 3 million tons (nitrogen content) of nitrogenous fertilizers in 1975.[11] Existing large plants are located in Nanking, Kwangchow (or Canton), Dairen (or Talien), Lanchow, Kaifeng, Shanghai, Kirin, Luchow (in Kwangsi), Chuchow (in Hunan), Hofei

[10] New China News Agency (Peking). Nov. 11, 1975.
[11] Pages 81–84 of work cited in footnote 4.

(in Anhwei), Yangchow (in Kiangsu), Liling (in Hunan), Tsinan (in Shantung), Taiyuan (in Shansi), and Kunming (in Yunnan). Since the 1960's, more than 1,000 small- to medium-sized plants have been built around the country. The small ones have a capacity of about 3,000 tons per year and the medium ones, 50,000 to 100,000 tons. Increasing interest has been shown in installing new petrochemical and fertilizer complexes at oilfield or refinery areas, and this should add greatly to the national total in the future.

With the 13 large plants purchased from abroad, China's nitrogen production capacity will be greatly increased. All told, these plants will be producing about one-half as much nitrogenous fertilizers as is currently used in the United States. They will also bring China's production to more than 5 million tons of nitrogen by 1978. Most of these plants were bought from Kellogg Continental Co. or affiliates, and standard equipment for each plant includes a 1,000-ton-per-day ammonia unit and a 1,600-ton-per-day urea unit.

Meanwhile, China continued to import large quantities of fertilizers from abroad, mainly from Japan. That country normally furnishes China yearly with about 1.4 million tons of urea, 600,000 tons of ammonum chloride, and 500,000 tons of ammonium sulfate. Import tonnages dropped sharply in 1974 because of China's balance-of-payments difficulties, but picked up again in 1975. Contractual negotiations between the two countries have been drawn out in 1975 because of sagging prices. Chinese imports of nitrogenous fertilizers have been equivalent to more than one-third of output.

Phosphates.—China possesses sizable and widespread deposits of uneven-quality phosphate rock and apatite, located mainly in south China with some in Shantung Province. However, production has not been adequate in meeting demand. The three-fold increase in price for imported phosphate rock in recent years no doubt has spurred China on to more intensive domestic searches. Morocco was the dominant supplier until 1973, but North Vietnam (mainly Laokay), Algeria, Egypt and the United States (Florida) have since taken up the slack. Apparently, China imported 1,100,000 tons of phosphate rock in 1972, 1,800,000 tons in 1973 (1 million from Morocco), and only 400,000 tons in 1974. Chinese imports of manufactured phosphates are not large compared with the 3 million to 4 million tons per year produced within China.

Phosphate deposits and mines have been reported at Chinghsiang in Hupeh; Kaiying in Kweichow; Liuyang, Shihmen, and Huachiao in Hunan; Nantung in Kiongsu; Chaoyanglin in Kwangsi; Anching in Anhwei; Kunyang in Yunnan; and Jungcheng in Shantung. Large phosphate fertilizer plants are located at Nanking, Changsha (Hunan), Hunghochou (Yunnan), and within the Hupeh Metallurgical Works. However, three-quarters of the chemical phosphates output have come from hundreds of small and medium plants associated with local mines. The medium-sized plants generally produce tens of thousands of tons of phosphatic fertilizers annually, along with other chemical fertilizers.

Fluorspar.—China has been an important world producer and exporter of fluorspar for several decades, and output in 1975 probably topped 350,000 tons. A large surplus has been traditionally exported, mainly to Japan, which took 179,485 tons in 1974 and 105,486 tons in 1975. The U.S.S.R. took 84,840 tons in 1974. Most fluorspar is metallurgical grade, but a significant share of the output is acidspar. Very high-grade lump fluorspar was offered in the U.S. market near yearend 1975, but high shipping costs and duty ($8.40 per long ton for metspar and $2.10 for acidspar) here illustrate the difficulty in selling in faraway places. In fact, world demand was depressed for most of 1975. Possibly 80,000 tons of fluorspar were consumed in China during 1975, including at least 50,000 tons by the steel industry and 10,000 tons by the aluminum industry. China was becoming interested in hydrofluoric acid.

Historically, the leading producing districts have been Wuyi in Chekiang, Kaiping in Liaoning, and Lunghua in Jehol. The new Taolin mine in Hunan, also a lead-zinc producer, probably produced over 80,000 tons of acidspar in 1975. Chinese fluorspar resources seem to be extensive and widespread, occurring also in provinces like Shantung, Fukien, and Kwangtung.

Magnesite, Soapstone, and Talc.—These geologically associated minerals occur in a belt extending from Tashichiao (or

Taling) northeast to Lienshankuan in Liaoning Province. The country's magnesite resources are very extensive by world standards and are of reasonably high grade. Yearly production may be about 1 million tons to meet the expanding needs for refractories in the steel industry and demand for magnesia in export markets such as Japan.

Chinese talc from Tashihchiao near Haicheng is very high grade (steatite-grade talc). Japan, the main customer, imported 74,687 tons of Chinese talc in 1972, 101,070 tons in 1973, 134,624 tons in 1974, and 97,052 tons in 1975. Based upon this and imports by other countries, China's 1975 talc production probably surpassed 250,000 tons in 1973, 134,624 tons in 1974, and soapstone are also produced at Tashihchiao annually. Japan was again the leading buyer of Chinese soapstone, importing 72,163 tons in 1973 and 68,448 tons in 1974. The Luchuan deposit in Kwangsi Province has been mentioned as a new area for talc and soapstone. Increasing quantities of talc, soapstone, and pyrophyllite will be needed in China for making paper and paint and for filling materials in general.

Pyrite and Sulfur.—China's annual output of perhaps 2 million tons of pyrite makes it a large world producer. The two important pyrite mines are Hsiangshan in Anhwei and Yingte in Kwangtung. The main use of pyrite in China is in the manufacture of sulfuric acid and fertilizers. The iron residue derived is utilized, and China was interested in the Japanese Kowa Seiko process for this purpose. Additional pyrite has been produced in Szechuan and Shansi Provinces, but output is not counted towards China's total, because this pyrite is converted to possibly 250,000 tons of elemental sulfur annually. Waste sulfur dioxide gases from smelters and chemical plants are increasingly utilized. No significant brimstone deposit has been reported. Oil refineries could recover more sulfur, but sulfur-removal facilities are inadequate and Chinese oil is basically low in sulfur. China formerly exported sulfur, but has become an importer recently, indicating that demand in paper, textiles, and industries in general is rising. China apparently imported 420,000 tons of sulfur in 1973 (about two-thirds from Canada) and 300,000 tons in 1974 (about two-thirds from Mexico).

Salt.—China reportedly met its 1975 salt production target 80 days ahead of schedule, with output already topping the record year of 1974.[12] By mid-July, Hopeh Province's saltfields, headed by Tangku, had overfulfilled its 1975 plan by 40%. Szechuan Province's 1975 salt output (from brine associated with natural gas) was about one-fourth higher than in 1974. Shantung's Yangkou saltfield reportedly surpassed its yearly plan by 75%. Generally, Chinese evaporation saltfields along the coast, which supply by far the bulk of the national output, have all become much more mechanized.

China has abundant and widespread resources of various kinds of salt necessary for the developing of a strong chemical industry and feeding a very large population. Salt output may have reached 30 million tons yearly, and the rock salt potential is hardly touched. An increasing number of saltworks and derivative chemical works are being built. China has always had a surplus of salt to sell, but foreign demand is limited. However, domestic requirements are rising sharply.

MINERAL FUELS

Coal.—Many Chinese coalfields reported plan fulfillment and output gains, with the coal industry as a whole registering a production increase of possibly 5% to 7% over 1974 levels and reportedly attaining an alltime high. China's 1975 coal production is estimated at 470 million tons, a figure which includes some mine-run and off-grade coals that, nevertheless, are directly used. Even compared with U.S. coals, it is safe to say that China produced more than 400 million tons of equivalent good-quality coal in 1975.

The major thrusts in coal activity in 1975 were steady buildup of most major coalfields and their mines, development of many small and medium coal mines in the south, increased mechanization in general, improved coal beneficiation and recovery, and more careful investigation of coking coal resources, distribution, and export possibilities. Foreign countries are becoming more familiar with China's coal industry, as an increasing number of foreigners have been able to visit specific fields and

[12] New China News Agency (Peking). Nov. 17, 1975.

more Chinese workers knowledgeable in coal have gone abroad.[13]

There was specific news on China's foremost coal bureau, Kailan (or Kailuan), between Tientsin and the sea where the Takang oilfield is located. Its 1975 output through December 23 was reported at 25.2 million tons of mine-run coal.[14] Compared with U.S. marketable coal, this should be discounted 10% to 20%. Kailan's output from seven collieries has been raised more than 1 million tons yearly since 1968. One key measure has been the expansion of hoisting capacity of shafts. In early 1976, a national record of producing about 11,000 tons of raw coal at one mechanized working place in 24 hours reportedly was established at the Tangshan colliery.[15] In fact, a new coal-cutting process was developed at Tangshan. Despite the high rate of extraction, the overall position of Kailan has improved and its coking coal reserves alone are estimated at 9 billion tons. Kailan coal seams are 1–6.5 meters thick and quite variable in dip. Kailan is producing about 3 million tons of coal annually by hydraulic mining. New shafts driven through fault zones made it possible to retrieve an additional 4,500,000 tons of coal at the Tangchiachuang colliery. Consolidation of workings boosted output to nearly 5 million tons per year at the Linhsi colliery.

Improving the filtering system at the Luchiato coal-washing plant greatly cut down loss of fines. At the Machiakou colliery, where the coal seams are very steep, expanding mechanization greatly increased output. With many auxiliary facilities and workshops, Kailan has been built up into an important industrial complex.

Shansi Province, headed by the Tatung Coal Bureau and the Yangchuan Coal Bureau, produced about one-sixth of China's total output, or 60 million to 70 million tons, in 1975; this province's coal reserves recently have been estimated at 400 billion tons. With 13 pairs of major mine shafts, Tatung must be producing close to 20 million tons of mine-run coal annually. It fulfilled its target 34 days ahead of time, and 1975 output of this bureau was about 10% more than in 1974. One of Tatung's mines—Meiyukou—produced 1.63 million tons of clean coal in 1975 from gently sloping coalbeds up to 2.2 meters thick.[16] During 1966–74, Tatung's raw coal output grew at an annual rate of 1.2 million tons. To boost production further, a 10-year plan was put in effect aimed at increasing output threefold.[17] Near yearend 1975, China was exploring the possibility of selling Tatung coal to Japan. A large part of Tatung's coal is coking quality.

Yangchuan, with 12 pairs of mine shafts, is the leading anthracite producer in China, it fulfilled its 1975 target 41 days ahead of time and probably produced 7 million to 9 million tons during the year. Roughly one-half of the more than a dozen seams are workable, and most seams are 1 to 6 meters thick. Yangchuan's No. 4 mine has a daily capacity of 5,000 tons and employs nearly 5,000 workers. Yunkangshih, a coal mine bureau about 55 kilometers west of Tatung, produced about 1.5 million tons in 1975 and plans to produce 6 million tons by 1985.

Production at the Fushun Coal Bureau, north of Anshan and east of Shenyang in Liaoning, has been declining because the open pit operations are extending underground. There are now two pits and three deep mines working on 8- to 120-meter-thick coalbeds in an elongated synclinal structure dipping 20° in the west, 50° in the east, and 70° in the north. Apparently, the output of cleaned coal dropped to 12 million tons in 1975 (3.6 million from the west pit). However, Fushun is increasingly important as an industrial complex, spurred by oil-refining, chemicals, and aluminum and copper extraction. Its shale-oil operation is probably finding it increasingly difficult competing with natural petroleum. The Fuhsin Coal Bureau, southwest of Shenyang, has reported a record daily output of 93,000 tons of mine-run coal, which would suggest an annual production to 15 to 20 million tons of cleaned coal. Fushun and Fuhsin have China's most famous open pits. Actually, most coal mines and deposits in China are underground and not particularly shallow.

The old Huainan and new Huaipei Coal Bureaus in Anhwei Province together produced probably more than 20 million

[13] Collins, H. E. A Mining Engineer Visits the People's Republic of China. Colliery Guardian (London), January 1976, pp. 26–30, and February 1976, pp. 43–46.

[14] Jen-Min Jih-Pao (Peking). Dec. 26, 1975, p. 1.

[15] New China News Agency (Peking). Apr. 11, 1976.

[16] Ta-Kung-Pao (Peking). May 25, 1976, p. 1.

[17] New China News Agency (Peking). May 17, 1975.

tons of marketable coal in 1975. Huainan, about twice the size of Huaipei, was being rejuvenated. Both have important coal washing plants, and some Huainan coal is of coking quality. Hokang, Chihsi, and Shuangyashan Coal Bureaus located near Harbin in Heilungkiang together produced about 30 million tons of mine-run coal in 1975. Hokang (with coking coal) and Chihsi are about twice the size of Shuangyashan. The new Pingtingshan Bureau in Honan continues to expand its coking coal facilities. With 13 collieries, its annual output is already in the 10-million-ton-per-year range.

A new integrated coal center called Holanshan has been built up in Ninghsia Province, embracing four coalfields (Shihchuaishan, Shihtanchung, Juchikou, and Hulussutai) in a mining area spread over 50 kilometers.[18] Construction was started in 1956, and Holanshan now has eight pairs of big and medium shafts, an open pit coal mine, a large coal-washing plant, and industrial systems covering engineering design, shaft construction, and mining-machinery manufacture. It provides anthracite and bituminous coal for about 350 industrial enterprises in about six provinces of north and northwest China. Output in 1975 was 2.4 times that in 1965. The Holanshan center must be producing at least 5 million tons of cleaned coal annually.

A new coal mining center named Paoting has also been built up in Southwest China.[19] Located in the mountains of southern Szechnan, this center covers 100 square kilometers and was first opened in 1965. There are over 100 seams, but rugged terrain and bad weather and working conditions made it difficult to open up the center. A thermal powerplant using coal from small mines had to be built first, in order to develop large-scale mines. Paoting now has seven pairs of modern shafts, a coal-cleaning plant, six industrial plants, aerial tramways, powerlines, and mine railroads. Two of the subdivisions are called Taiping and Lungting. This coal center has an annual capacity of possibly 5 million tons of coal.

In addition to the large coal bureaus and centers described so far, China has possibly 70 more producing between 500,000 to 10 million tons per year of coal. The buildup of small to medium coal mines in the south has been mentioned. It should be pointed out also that small mines around the country, some tributary to large mines, together furnish about 30% of the national coal output.

Petroleum and Natural Gas.—Most oilfields reported significant gains. China's overall 1975 oil output reached possibly 80 million tons, roughly one-fourth over that of 1974. During the last 3 years, production rose roughly twofold. This was made possible through bringing in new oilfields and rejuvenating old ones, along with setting up facilities for oil distribution (pipelines and tankers for example), refining, further processing of the oil into petrochemicals, handling at ports, and exports. Natural gas from Szechuan came into its own, and gas from oilfields was utilized to an increasing degree. The surge of crude oil has relegated China's shale oil to an unimportant position. However, China is still one of the two world producers, and its combined output of shale oil, from Fushun and Maoming, may still be 3 million tons yearly.

Taching—China's premium oilfield—exemplifies an industry where there are no small-scale operations. Located in the Sungliao Plain northwest of Harbin, Taching became fully operational by 1964. The oilfield is of lakebed origin, mostly occurring at only 1,000 meters depth. Reserves in the old field have been estimated at up to 900 million tons, but this probably is conservative. Taching's new field, 40 to 60 kilometers away from the old field, is near the production stage and is reportedly rich in gas. The whole complex produced possibly 35 million tons of crude oil in 1975, and output should expand further when the new field reaches maturity. Taching has been very important to China's overall industrialization program; it supports many refineries and is connected by pipelines to Fushiun, Tiehling, Chinhuangtao, Peking, and North Korea. Taching's low-sulfur oil is very much preferred by Japan, and has been shipped to Shanghai and cities inland and further south as well. Taching workers have been sent around the country to help develop other oilfields, refineries, and petrochemical facilities. Another oilfield by the name of Fuyu is probably being developed in the northeast.

Shengli, located near the mouth of the Yellow River, has become one of the largest

[18] Ta-kung-pao (Peking). May 25, 1976, p. 1.
[19] China Reconstructs. New Coal Mining Center in Southwest China. May 1976, p. 19.

oilfields in China. Production began a decade ago, and full potential has not yet been reached. China claims a one-third increase in production in 1975 over that in 1974, bringing production up to possibly 15 million tons. Surveying and construction began in two new areas in 1973. Oilfield depths range from about 1,000 meters to 2,500 meters. The crude oil is low in sulfur but high in salts, requiring special treatment before shipment to domestic refineries and export markets in Japan. Shengli just finished building a 2.5 million-ton-per-year refinery in addition to its first refinery with a 3.5-million-ton capacity. The new refinery is part of a not-yet-completed petrochemical and fertilizer complex. A pipeline links Shengli with the new port of Huangtao near Tsingtao where suitable oil-handling facilities have been newly completed.

The third big new oilfield, Takang, is 60 kilometers southeast of Tientsin along the Pohai Bay coast and was discovered on top of solar salt flats. Geology and operational problems have been complicated because faulting is severe and the depth of the oil varies between 1,000 and 3,000 meters. Intensive drilling led to the conclusion that the best oil and gas wells were near the main faults, with small secondary pools near other large faults. Since Takang is near the shore, offshore oil is a possibility, although some geologists feel that the presence of grabens limit the oil potential. Takang's output has been rising sharply in recent years, after initial difficulties were overcome. Output should be topping 10 million tons annually, and eventually rising to 15 million to 20 million tons. Oil and gas are piped to Tientsin, where a large refinery and petrochemical complex is being expanded. The Chinese have been talking with the Japanese about liquefied natural gas (LNG) from this location.

Once the mainstay of the Chinese oil industry, and now revived, is the Karamai Field in Sinkiang. Output in 1974 was brought up to several times the 1965 level, and the gain in 1975 production, over that of 1974 was reported at 65%.[20] This suggests that 1975 production may have reached 5 million tons. There are local refineries and pipelines, and some crude oil goes to Lanchow. The first Chinese oilfield of any consequence, Yumen, was being stablized. According to a Japanese author "aside from Taching, Shengli, and Takang, the 9–23 field (probably I-tu, south of Shengli) and the 5–7 field (possibly Shahshih) in Hupeh Province being developed, show great promise." [21] Various fields have been discovered in Tzaidam (Tsinghai) also. These are all implications of China's great oil potential, and offshore possibilities make this potential even greater.

Szechuan Province leads China in natural gas production and utilization. Output there has quadrupled in the last decade, and may be leveling off at possibly one-tenth of total U.S. production. Careful seimic surveys revealed over 200 gas structures. More than 1,000 kilometers of pipelines have been built. Natural gas in Szechuan is said to fuel two-thirds of the iron and steel enterprises and 84% of the salt-crystallization facilities, as well as many other industries such as cement, and provides the raw material for more than 70% of the fertilizer plants. In late 1975, the Chinese were talking to Japanese not only about purchasing LNG facilities, but also natural gas refining plants. Greater utilization of natural gas is another clear indication of China's energy push.

China has made great strides in oil processing and handling. Many new refineries have been built in almost all of the large commercial, industrial, and oilfield centers. Their combined capacity approximates the difference between output minus exports of crude oil; China has also placed great stress on petrochemicals, which are now lagging somewhat behind. The pipeline-construction program had to be accelerated as existing fields were expanded and new fields brought into production. China's port-expansion program also made significant headway in 1975.[22] Various new deepwater wharves have been placed in operation, including loading terminals capable of accommodating 25,000-ton to 100,000-ton tankers and 10,000-ton berths for handling coal and mineral ores. A new refinery and petrochemicals port complex was being built in the Shanghai area, with crude oil coming by coastal tankers from the north. At Shanghai, railway lines and automatic coal- and grain-handling systems were also added, and the Yangtze estuary

[20] Jen-Min Jih-Pao. Dec. 29, 1975, p. 1.
[21] Ta-Kung-Pao. Oct. 10, 1974, p. 2.
[22] Journal of Commerce. Jan. 12, 1976, p. 10.

was dredged for 20,000-ton freighters. The first stage of an oil terminal was completed at Chinhuantao, Taching's outlet. Large-scale harbor extension has been reported at six other major ports. A recent Japanese mission says that Peking is planning to construct a large refining and petrochemical complex in the port area of Wampoa, reflecting possibly the proximity of the unconfirmed Nanhai oilfields, about 70 kilometers west of Kwangchow (or Canton).

The Mineral Industry of Colombia

By Daniel C. Adkins [1]

Colombia's mineral industry displayed an overall upward trend during 1975, although crude oil production declined for the fifth year. The output of most mineral commodities increased or remained the same, while the value of mineral production increased greatly. The estimated value of minerals produced changed from near $175 million [2] in 1974 to $250 million in 1975, representing over 2% of the Colombian gross national product (GNP). If Colombian mineral fuels were computed at their international market price, the value of Colombian minerals would be 7% of GNP. Most of the increase in value can be equally attributed to price increases in gold and hydrocarbons. Iron ore, lime, natural gas, petroleum, precious metals, and salt are the country's most valuable mineral products.

Estimated value of Colombian mineral production, in million U.S. dollars, follows:

	1974	1975
Mineral fuels	133	173
Metallic minerals	18	55
Nonmetallic minerals	24	22
Total	175	250

Government action directly affecting the mineral industry during 1975 included: (1) price increases by the Ministry of Mines and Energy of new oil, marginal crude from old oilfields, refined products, and nonassociated natural gas; (2) the phasing out of the petroleum dollar, which gives an unfavorable exchange for petroleum; and (3) the Presidents of Colombia and Ecuador signing an agreement to respect each country's sovereignty over marine and submarine areas to a distance of 200 miles.

The Colombian mineral survey agency, Institute of Geological and Mineral Investigations (Ingeominas), cooperated with the United Nations Development Program and the U.S. Agency for International Development (AID) in numerous mineral resource explorations. These explorations have resulted in the geologic mapping of 125,000 square kilometers, or 10% of Colombia. Special attention was given to searching for base metals, bauxite, gold, iron and nickel, asbestos, gypsum, limestone, phosphate, and coal. The U.S. Geological Survey has cooperated with these efforts by providing educational assistance for Colombian personnel.

PRODUCTION

Metallic minerals varied in output with significant increases only in gold and iron ore. Production changed little in nonmetallic minerals.

Petroleum output declined for the fifth consecutive year as private companies continued to encounter inadequate stimulus for investment even with an increase in price. Crude oil production was down 5.9% to 57.3 million barrels. Production of other fossil fuels increased.

[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$32.90=US$1.00 for 1975 and Col$26.11=US$1.00 for 1974.

Table 1.—Colombia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Chromite, gross weight	12,000	[e] 12,000	[e] 12,000
Copper, mine output, metal content [e]	70	70	70
Gold ---- troy ounces	215,876	265,195	308,864
Iron and steel:			
Iron ore and concentrate ---- thousand tons	480	510	595
Pig iron ---- do	264	240	297
Crude steel ---- do	339	311	366
Semimanufactures, hot rolled ---- do	265	270	294
Lead, mine output, metal content	153	126	114
Manganese ore, gross weight	12,000	6,000	14,000
Mercury ---- 76-pound flasks	144	79	[e] 100
Platinum-group metals ---- troy ounces	26,358	21,094	22,114
Silver ---- do	[r] 75,768	79,692	87,562
Zinc, mine output, metal content	146	37	7
NONMETALS			
Barite	1,922	2,500	3,000
Cement, hydraulic ---- thousand tons	3,221	3,432	3,091
Clays:			
Bentonite	[r] 1,197	998	[e] 1,000
Kaolin [e] ---- thousand tons	100	105	105
Other [e] ---- do	200	715	750
Diatomite	350	550	[e] 550
Feldspar	30,000	28,700	30,000
Fertilizer materials:			
Crude, phosphate rock	10,421	12,000	13,000
Manufactured (gross weight):			
Nitrogenous	[e] 110,000	NA	NA
Phosphatic	[e] 50,000	NA	NA
Other, including mixed	[e] 300,000	NA	NA
Fluorspar	[e] 4,000	(2)	--
Gypsum ---- thousand tons	95	198	200
Lime [e] ---- do	1,000	1,000	1,000
Magnesite	[e] 1,800	1,700	785
Mica, all grades [e]	40	40	40
Precious and semiprecious stones, emerald:			
Gem stones ---- thousand carats	[3] 109	[e] 1	NA
Morralla ---- do	[3] 7,095	[e] 4	NA
Salt:			
Rock ---- thousand tons	[r] 283	184	185
Other ---- do	[r] 1,047	691	741
Total ---- do	[r] 1,330	875	926
Sand	NA	360,000	370,000
Sodium and potassium compounds, caustic soda	70,218	59,506	58,294
Stone:			
Dolomite ---- thousand tons	44	1	30
Limestone ---- do	7,000	7,620	NA
Marble ---- cubic meters	[e] 15,000	NA	3,500
Sulfur:			
From ore	27,800	30,612	[e] 31,000
Petroleum refinery byproduct [e]	3,000	3,000	10,000
Total [e]	30,800	33,612	41,000
Talc, soapstone, and pyrophyllite	900	800	1,000
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	22,500	25,000	25,000
Coal, all grades ---- thousand tons	3,300	3,600	3,900
Coke, all types ---- do	540	400	400
Gas, natural:			
Gross production ---- million cubic feet	113,229	116,634	120,754
Marketed production ---- do	65,045	65,792	65,905
Natural gas liquids:			
Propane ---- thousand 42-gallon barrels	1,271	1,268	2,811
Butane ---- do	733	718	734
Natural gasoline ---- do	928	1,338	1,324
Total ---- do	2,932	3,324	4,869
Petroleum:			
Crude oil ---- do	66,844	60,867	57,259
Refinery products:			
Aviation gasoline ---- do	468	467	428
Motor gasoline ---- do	19,094	20,077	21,219

See footnotes at end of table.

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

Commodity [1]		1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum—Continued				
Refinery products—Continued				
Jet fuel	thousand 42-gallon barrels	1,801	2,091	2,445
Kerosine	do	3,134	3,329	3,355
Distillate fuel oil	do	8,144	8,439	6,619
Residual fuel oil	do	17,650	17,927	17,496
Lubricants	do	34	376	311
Other:				
Liquefied petroleum gas	do	1,932	1,867	1,753
Naphtha	do	1,766	1,399	99
Asphalt and bitumen	do	730	767	554
Petroleum coke	do	3,695	2,328	2,393
Miscellaneous and unspecified	do			
Refinery fuel and losses	do	1,265	1,026	1,013
Total	do	59,713	60,093	57,685

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] Revised to none.
[3] Exports.

TRADE

Colombia maintained a $57 million petroleum trade surplus during 1975. With consumption below expected levels only 2 million barrels of gasoline was imported, while nearly 9 million barrels of fuel oil was exported. However, if current declines in oil production continue, Colombia will be a net importer of petroleum by 1976.

During April and May the Ministry of Finance and Public Credit increased import duties to increase revenues and protect local industries. The increases affected metallic ores and metals and metal products.

The latest available statistics on foreign trade in mineral commodities are given in the 1974 Minerals Yearbook.

COMMODITY REVIEW

METALS

Copper.—A copper mine near Ibaqué in the Department of Tolima attained a production of 350 tons of copper concentrate per day. This mine has limited proved reserves but substantial potential reserves. Pronociones Industriales y Mineros operates the mine, which is owned by United States, Panamanian, and Chilean interests.

Iron and Steel.—Colombia's largest iron and steel manufacturer, Acerías Paz del Río, S.A., was planning a major expansion of its Belencito plant, from 300,000 to 1 million tons per year of crude steel capacity by 1980. A study of this expansion was to be completed in early 1976 by Arthur G. McKee & Co. of Cleveland, Ohio.

Nickel.—Feasibility studies of the Cerro Matoso ferronickel project were to be finished by 1976. The studies include marketing and financing as well as a pilot plant. Total investment may be near $250 million in order to produce 25,000 short tons per year of ferronickel by 1979. The Cerro Matoso project is owned one-third by Empresa Colombiana de Niquel Limitada, a subsidiary of the State-owned Institute of Industrial Development (IFI), and two-thirds by Compañía de Niquel Colombiano, S.A., a joint venture of the Hanna Mining Co. and Chevron Oil Co.

Precious Metals.—Production of precious metals increased during 1975 with gold increasing 16%, followed by silver 10%, and platinum 5%. Gold production has increased 64% in the last 3 years owing to worldwide price increases. The Government's 1974 decision to raise the price domestic producers received for gold to the international market level resulted in a 365% increase in the value of gold produced, as the price rose from $41.90 to $153.50 per ounce in 1975. All precious metal production must be sold to the Bank of the Republic, and as of November 1975 all mining operations must be registered.

The Ministry of Mines and Energy is restricting foreign precious metal mining by prohibiting foreign remittance of development costs and by eliminating other stimuli for investment.

Radioactive Minerals.—Several known deposits of uranium and thorium have been declared national reserves by Presidential decree. The Ministry of Mines and Energy intends to preserve these resources for future use while allowing a domestic company, Minuranio, to develop deposits in the Santander Department. Current agreements with foreign firms for exploration and development will be respected.

NONMETALS

Asbestos.—Work neared completion on the Las Brisas asbestos project in the Department of Antioquia. Upon completion in 1976, the project should process 50,000 tons of fiber annually. Proven reserves will cover 15 years of production. The mining and milling facilities are to be operated by Asbestos Colombianas, S.A., which is owned by Eternit Colombiana (70%) and other private Colombian investors.

Fertilizer Materials. — *Phosphate.* — The Colombian mineral survey agency, Ingeominas, with assistance from AID has explored a phosphate deposit with proven reserves of 20 million tons and possible reserves of 300 million to 400 million tons.

MINERAL FUELS

Coal.—At yearend Colombia was planning to establish a state enterprise for exploration, production, and marketing of domestic coal in association with private investors. The company, Empresa Colombiana del Carbon (CARBOCOL), may be funded by IFI, Empresa Colombiana de Petróleos (ECOPETROL), and Ingeominas. CARBOCOL's first project will be to review concession agreements between IFI and Peabody Coal Co. and also between ECOPETROL and private energy companies.

The proposed Colombian-Brazilian exchange of coking coal for iron ore has been terminated by the Colombian Ministry of Mines and Energy.

Natural Gas.—The Colombian division of Texas Petroleum Co. (TEXPET), a subsidiary of Texaco Inc., has reported a second onshore gasfield discovery in the Department of Guajira. The discovery well is located 11 miles (18 kilometers) southwest of the Bellena gasfield and 5 miles (8 kilometers) northeast of the city of Riohacha. The natural gas well flowed at a rate of 10.7 million cubic feet daily (300,000 cubic meters daily). All of TEXPET's three gasfields are located in the same 12,150-square-kilometer association contract with ECOPETROL.

The Colombian Government established new prices for nonassociated gas in July 1975. Sales to local utilities were set at 50 cents per thousand cubic feet, while others were set at 80 cents per thousand cubic feet. Sales were to be paid 75% in dollars and 25% in pesos.

Petroleum.—Colombian policy has been: (1) to increase national participation in petroleum activities while encouraging foreign oil companies to develop petroleum production and refining; (2) to provide cheap energy as a stimulus for domestic industrialization; and (3) to earn monies from oil exports. The changes in the world petroleum markets have created a challenge to Colombian policies.

Colombia tried to insulate itself from market changes by freezing prices, but this discouraged the international oil companies which were the main energy development force. Oil production reached its high point in 1970 when the Colombian value of crude oil approximated the world price. Before the Organization of Petroleum Exporting Countries (OPEC) price hikes of 1973, Colombian oil prices had shrunk to 60% of world values. After the hike, they were at 15% of world values. The result was a rapid decline in production and exploration. As the investment climate grew dismal, oil production declined from being 40% (1970) to 10% (1975) in excess of domestic demand.

The results of Colombian attempts to increase national participation have varied. At the peak of production in 1970, state participation shrank to 12% from 15% for the previous 4 years as foreign oil companies expanded production. As the market deteriorated, Colombia-owned production increased from 12% to 45% at yearend 1975 owing to (1) ECOPETROL's purchase of concessions, (2) a shift to association contracts, (3) increased Colombian private sector activities, and (4) decreasing oilfield productivity fostered by lack of incentives for field maintenance. If the price increases initiated during 1975 continue, the Colombian share of production should decline somewhat as foreign oil companies increase production.

Table 2.—Oil companies in Colombia on December 31, 1975

Company	Affiliation	Ownership (percent)	Nationality of company	Activities [1]
Anshutz Corp	Anshutz Corp	100.0	United States	B
Antex Oil and Gas Co. Inc	Petroquimica del Atlántico and U.S. citizens	NA	Colombia/ United States	A
Aquitaine Colombie S.A	Société Nationale des Petroles d'Aquitaine (SNPA)	100.0	France	AB
ARCO Colombia Oil Corp	Atlantic Richfield Co	100.0	United States	B
Chevron Petroleum Co. of Colombia.	Standard Oil Co. of Calif	100.0	do	ABC
Colombia-Cities Service Petroleum Corp. (COLCITO).	Cities Service Co., Inc. (operator)	25.0	do	BC
	Atlantic Richfield Co	25.0	do	BC
	Amoco Colombia Oil Co	25.0	do	BC
	ECOPETROL	25.0	Colombia	BC
Det Norske Oljeselskap A/S	Det Norske Oljeselskap A/S	50.0	Norway	B
	INTERCOL	50.0	United States	B
Empresa Colombiana de Petróles (ECOPETROL).	Colombian Government	100.0	Colombia	ACD
Energy Reserve Co	NA	100.0	United States	B
Exploraciones Condor S.A	ECOPETROL	100.0	Colombia	AC
Farmland International Energy Co.	Farmland Industries Inc. (operator)	25.0	United States	B
	City Investing Co	25.0	do	B
	Total Exploration	25.0	France	B
	Reserve Oil and Gas Co	12.5	United States	B
	Fuyo Petroleum Development Corp	12.5	Japan	B
International Petroleum Colombia, Ltd. (INTERCOL).	Exxon Corp	100.0	United States	ABCD
Petróleos Colombo-Brasileros (COLBRAS).	Petróleos Brasileiro S.A. (PETROBRAS)	50.0	Brazil	AC
	Colombian citizens	50.0	Colombia	AC
Petrolera del Rio S.A	Texaco, Inc. (operator)	50.0	United States	BCD
	ECOPETROL	25.0	Colombia	BCD
	Cayman Corp	20.0	United States	BCD
	City Investing Co	5.0	do	BCD
Texas Petroleum Co. (TEXPET).	Texaco, Inc	100.0	do	ABCD
Webb Resources, Inc	Webb Resources, Inc	100.0	do	B
Others	Various	NA	NA	A

NA Not available.
[1] A=concession contract. B=association contract with ECOPETROL. C=crude oil production. D=petroleum refining.

The possibility that current Colombian price increases may renew interest in Colombia may be seen in the one-third increase in concession area between yearend 1974 and yearend 1975 shown in the following tabulation:

Colombian concession agreements	Hectares Dec. 31, 1974	Hectares Dec. 31, 1975
Concession contract	4,573,417	2,704,312
ECOPETROL's concession	1,100,815	1,248,335
Association contract with ECOPETROL	5,157,728	10,239,400
Total	9,731,145	12,943,712

Source: American Association of Petroleum Geologists.

Exploration and drilling have declined to the lowest level in over a decade. Exploration decreased to 54 party-months of seismic and surface geologic exploration compared with nearly 60 party-months in 1974. A summary of petroleum and natural gas exploration activities during 1975 follows:

	Geological	Seismic	Total
ECOPETROL	5.0	17.0	22.0
Private companies	3.7	28.6	32.3
Total [1]	8.7	45.6	54.3

[1] American Association of Petroleum Geologists.

The number of exploratory wells dropped from 16 to 11, while ECOPETROL's plans for retaining petroleum self-sufficiency call for drilling 80 wells. Three companies made oil discoveries and two found gas. The Cayman Corp., which found oil in the Putumayo Department during 1974, sold its exploratory and pipeline interests to Farmland Industries of Kansas City, Mo. A summary of drilling activities follows:

	1974	1975
Exploratory wells	16	11
Total ECOPETROL wells	6	7
Total wells [1]	37	28
Total footage drilled [1]	277,740	197,683

[1] American Association of Petroleum Geologists.

Colombian petroleum production declined 5.9% to 57.3 million barrels. Petróleos Colombo-Brasileros (COLBRAS) was the only company showing a production increase; other firms' production declined an average of 11%. Few companies were willing to counter the falling rate of production with the price of old oil at $3.50 per barrel.

Domestic consumption of refined products leveled off at 51.9 million barrels; the only rapid increase was a 14% rise in jet fuel use to 2.4 million barrels yearly.

Table 3.—Colombia: Salient statistics of petroleum and natural gas

	1973	1974 r	1975
Crude oil:			
Production ---------- thousand 42-gallon barrels	66,844	60,867	57,259
Delivered to refineries ---- do	56,966	58,768	56,568
Exported ---- do	9,452	480	--
Natural gas:			
Production ---- million cubic feet	113,229	116,634	120,754
Consumption [1] ---- do	59,966	61,090	60,899
Injected ---- do	30,058	31,238	30,269
Flared ---- do	18,125	19,604	24,580
Natural gas liquids:			
Production [2] ---- thousand 42-gallon barrels	r 2,933	3,324	4,869
Delivered to refineries ---- do	1,434	1,275	NA
Refinery products:			
Refinery output [3] ---- do	r 59,713	60,093	57,685
Consumption [4] ---- do	r 48,706	51,639	51,948
Exported ---- do	13,062	10,616	8,785

r Revised. NA Not available.
[1] Includes oil company use for fuel.
[2] Natural gas liquids production includes condensate, natural gasoline and liquid petroleum gas (LPG).
[3] Includes refinery losses and refinery fuel, but not treatment of natural gas liquids.
[4] Excludes LPG, aviation fuel to international carriers, and bunker sales.

Table 4.—Oilfields in Colombia

Company, oilfield and discovery date	Geologic basin	Production 1975 [1] (thousand barrels)	Reserves (million barrels) [e]	Gravity (° API)
Chevron:				
Rio Zulia, 1962	Southwest Maracaibo	[2] 4,298	74	41.2
COLCITCO:				
Pavoa, 1962	Middle Magdalena	1,621	NA	36.7
Other, 1933 to 1963	do	244	NA	NA
Total		[2] 1,865	NA	NA
COLBRAS:				
Dina, 1962	Upper Magdalena	1,968	NA	22.5
Tello, 1972	do	546	NA	19.5
La Canada, 1970	do	29	NA	NA
Total		[2] 2,986		21.8
ECOPETROL:				
Tibu, 1940	Southwest Maracaibo	3,172	41	37.2
La Cira, 1925	Middle Magdalena	5,876	35	24.0
Yarigui Cantagallo, 1945	do	3,114	NA	19.3
Casabe, 1941	do	2,122	23	20.7
Infantas, 1918	do	1,493	18	25.8
Lisama, 1965	do	1,168	NA	31.0
Boquete, 1961	Lower Magdalena	987	NA	43.0
Other, 1933 to 1970	Middle Magdalena and Southwest Maracaibo	2,031	NA	19.0–43.0
Total		[2 3] 20,055	117	NA
INTERCOL:				
Provincia, 1961	Middle Magdalena	5,647	55	33.0
Bonanza, 1964	do	688	NA	32.3
Total		[2] 6,334	55	32.9
Petrolera del Rio:				
Orito, 1963	Putumayo Basin	13,354	87	39.7
Loro, 1968	do	609	NA	NA
Other, 1965 to 1975	do	1,170	50	NA
Total		[2] 15,143	137	NA
TEXPET:				
Palaqua Velasquez, 1946	Middle Magdalena	5,774	60	19.0
Other, 1955 to 1963	Upper and Middle Magdalena	799	NA	14.0–28
Total		[2] 6,573	60	14.0–28
Chuchupa, 1973	Guajira Offshore	--	([4])	XX
Ballena, 1973	Guajira Onshore	--	([4])	XX
Riohacha, 1975	do	--	([4])	XX
Grand total		[2] 57,259	630	

[e] Estimate. NA Not available. XX Not applicable.
[1] American Association of Petroleum Geologists except as otherwise indicated.
[2] U.S. Embassy, Bogota. State Department Airgram A-83, July 19, 1976, p. 6.
[3] Includes 4,696,057 barrels produced by COLPET before Texaco's share reverted to ECOPETROL on Dec. 1, 1975.
[4] No petroleum reserves for the three Guajira gasfields. Natural gas reserves for all three gasfields total 3,900 billion cubic feet.

In 1975 the Ministry of Mines and Energy took several actions to stimulate production and exploration. The price of crude from new oilfields increased from $4.00 to between $5.50 and $7.00 per barrel. Oil found west of the Cordilleras will sell for $5.50 when found down to a depth of 7,500 feet, $6.00 when found between 7,500 and 12,500 feet, and $6.50 when found below 12,500 feet. Oil found east of Cordilleras will sell for 50 cents more at each of the above-mentioned depths. Most new oil is expected to be found east of the Cordilleras below a depth of 12,500 feet. The price of marginal crude from oilfields was increased from $1.64 to $3.50 for 27° API gravity oil with a 2-cent differential per degree change. The practice of selling crude production to refineries with 25% of each payment in pesos is called the petroleum dollar. Until September 1, 1975, the peso portion of payment was fixed at 20 pesos per dollar. By October the exchange rate was increased to 23 pesos per dollar, and it will continue to increase until equal to the official exchange rate.

Refining.—ECOPETROL has contracted with Technipetrol S.p.A. to expand the Cartagena refinery to 60,000 barrels per day and to increase the gasoline yield in the Barancabermeja refinery by 15,000 barrels per day. During 1975 Technipetrol began a detailed engineering study on the Cartagena refinery and finished an engineering study on the Barancabermeja refinery. ECOPETROL has postponed the Tumaco refinery and its associated petrochemical projects. The prices of refined petroleum products were also increased during 1975, from 15% to 80%. During the last 4 months of 1975 the price of regular gasoline increased 54%, or from 10 cents to 16 cents per gallon. The higher prices still do not give ECOPETROL a profit for refining, but should eliminate the refined product subsidy.

In 1975 three petrochemical projects were completed while several were being studied or constructed. The DOW Colombiana S.A. expanded its Cartagena polystyrene plant by 5,500 tons per year. Phillips Petroquimica completed a 2,000-ton-per-year carbon black plant in Cali. Zimmer AG completed a polyester resin plant for Vanylon S.A. in Barranquilla. Peliolefinas Colombianas S.A. (POLICOLSA), a subsidiary of ECOPETROL, has several projects in Barrancabermeja including ethylene and low- and high-density polyethylene plants. POLICOLSA also has plans for a terephthalic acid and dimethyl terephthalate (DMT) plant in Cali. Studies to utilize natural gas for ammonia production are being made for the Barrancabermeja and Guajira areas.

Pipelines.—ECOPETROL completed a 201-kilometer, 14-inch-diameter crude pipeline from Ayacucho to Barrancabermeja.

The Mineral Industry of Cyprus

By E. Shekarchi [1]

Since the hostilities of 1974 Cyprus has been split into two parts by a line running east-west through the capital city of Nicosia. The northern part of the island is Turkish-controlled through the Federated Turkish Cypriots; the Government of Cyprus and its instruments operate only in the south, except for the Central Bank which receives bank returns from Turkish commercial banks in the north. In 1975, the Cyprus pound continued to be used throughout the island, although use of the Turkish lira was increasing in the north. Because there were no real economic indicators for the north and statistics were very sparse, most of the information for 1975 was based on the Government of Cyprus' annual and periodic reports, which predominantly concerned the mineral industry of the south. The Government was making great efforts to revitalize the surviving economy in the south through international borrowing, foreign aid, and by encouraging investments.

The preliminary gross national product (GNP) for 1975, based on 1973 dollars, was estimated at $651 million,[2] a 16% decrease from the 1974 GNP. Per capita GNP decreased 24% in 1975 compared with that of 1974.

During 1975 the Government worked on a master reactivation plan for the south which appeared to concentrate on the agricultural and industrial sectors. In the industrial reactivation program, the Government guaranteed loans made by commercial banks to export-oriented industries, with particular emphasis on small mining ventures. Preliminary studies were conducted on setting up new cement plants, integrated fertilizer plants, glass container factories, asbestos-cement pipe factories, and ship repair yards. In the mining industry about 2,400 people were employed, compared with 2,600 in 1974 and approximately 3,000 in 1973.

The Geological Survey Department continued detailed geologic mapping, geochemical surveying, and geophysical work in the southern section of the island. Following the preliminary work, 16 boreholes were drilled in the areas of Layio, Mandria, and Lymbia. Detailed exploration work by the Geological Survey was for chromite, nickel, and copper in the Limassol Forest. Private companies also carried on prospecting and exploration work for chromite, sulfur, pyrite, and asbestos. Thirty-nine holes with a total footage of 14,800 feet were reportedly drilled by yearend 1975.

After about 60 years of operation, the largest mining company on the island, the U.S.-owned Cyprus Mines Corp. (CMC), was compelled by civil disturbance to discontinue its copper mining, exploration, and beneficiation activities in Cyprus. By yearend, the company had relinquished most of its leases and prospecting permits and had suspended all of its activities.

[1] Supervisory physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from Cyprus pounds (£C) to U.S. dollars at the rate of £C1 = US$2.43.

PRODUCTION

Mineral production on Cyprus for 1975 followed the same pattern as in 1974 except that the output from the largest company, CMC, was nil, making a serious impact on the exchange earning capacity of the country and the overall copper output.

Table 1.—Cyprus: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Chromite ore and concentrate (marketable)	[r] 29,749	33,753	27,623
Copper:			
Mine output, metal content [2]	[r] 14,200	11,200	9,900
Cement copper, gross weight	4,387	1,556	--
Precipitate copper, gross weight	510	1,111	--
NONMETALS			
Asbestos	31,706	31,456	35,394
Cement, hydraulic	456,851	342,203	616,858
Clays, crude:			
Bentonite	[3] 8,855	[3] 4,517	12,193
Other:			
For brick and tile manufacture thousand tons	254	200	120
For earthen dams do	488	NA	NA
For cement manufacture do	118	140	196
Gypsum:			
Crude	[r] 27,082	14,541	22,991
Calcined	10,305	5,377	4,869
Lime, hydrated	83,942	61,634	27,082
Mineral pigments:			
Terre verte [3]	1	1	3
Umber	25,846	13,231	[3] 4,205
Yellow ocher	189	225	[3] 220
Salt, marine	([4])	3,608	6,096
Stone, sand and gravel:			
Crushed and broken stone:			
Havara	823,000	685,834	665,352
Limestone:			
For cement production	449,236	239,788	457,251
Other	5,385	6,696	5,527
Marl for cement production	210,513	177,340	551,060
Unspecified building stone	792,519	53,852	48,872
Dimension stone, marble	50,802	39,524	22,150
Sand and aggregate thousand tons	3,439	3,216	1,568
Sulfur: Pyrite ore and concentrate, marketable:			
Gross weight:			
Cupreous	[r] 107,022	115,329	126,087
Other	[r] 362,805	61,694	79,286
Total	[r] 469,827	177,023	205,373
Sulfur content:			
Cupreous	[r] 49,744	53,605	58,605
Other	[r] 170,518	28,996	37,264
Total	[r] 220,262	82,601	95,869
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	942	684	517
Jet fuel and kerosine do	483	278	122
Distillate fuel oil do	1,148	907	772
Residual fuel oil do	1,307	891	463
Other:			
Liquefied petroleum gas do	198	155	139
Asphalt do	127	70	79
Unspecified do	460	367	329
Refinery fuel and losses do	297	226	167
Total do	4,962	3,578	2,588

[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 all exportable products, including copper concentrates, cupreous pyrites, cement copper, and copper precipitates.
[3] Exports.
[4] Revised to none.

TRADE

According to available published information, mineral exports in 1975 totaled 540,000 tons, an increase of about 28% over that of 1974. Reportedly the accumulated stock of minerals mined in previous years was also exported and included in this tonnage. Cupreous concentrates ranked first in export value, about $6 million, followed by asbestos at $5.2 million and iron pyrite at $3.9 million. The remainder of mineral exports were chromite, cupreous pyrite, and umber, collectively valued at about $2.6 million. No values for cement, copper, gypsum, and calcined ore were available. Imports of minerals remained high and in considerable imbalance with exports, the main item being petroleum for the Cyprus petroleum refinery.

Table 2.—Cyprus: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum, scrap	159	126	Italy 101; United Kingdom 25.
Chromium ore and concentrate	30,387	24,845	United Kingdom 10,533; Austria 10,112; Canada 4,200.
Copper:			
Concentrate	65,005	46,471	U.S.S.R. 18,501; West Germany 16,105; Spain 8,114.
Cement	6,543	2,457	All to West Germany.
Cupreous pyrite	33,403	23,334	West Germany 15,601; Netherlands 7,733.
Metal scrap	788	346	West Germany 173; Italy 51; Netherlands 51.
Iron and steel:			
Metal:			
Scrap	4,995	7,292	Italy 5,044; Greece 2,248.
Semimanufactures, tubes, pipes, fittings	5	29	Lebanon 17; Israel 9.
Lead, scrap	602	254	Yugoslavia 249.
NONMETALS			
Asbestos, crude	28,999	37,166	Denmark 10,028; United Kingdom 8,801; Greece 7,309.
Cement	11,433	39,464	Syria 31,835; Libya 7,629.
Clays and clay products	8,883	6,978	Mainly to Israel.
Gypsum	23,242	10,734	Mainly to Lebanon.
Lime	14,356	8,283	All to Libya.
Pigments, mineral	13,316	10,469	United States 6,442; United Kingdom 2,232.
Pyrites, unroasted	363,772	287,161	Turkey 95,362; Greece 77,864; Italy 45,079.
Stone, sand and gravel	902	173	All to Israel.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Distillate fuel oil thousand 42-gallon barrels	--	15	All to Greece.

Table 3.—Cyprus: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum including alloys, all forms	2,417	1,836
Copper including alloys, all forms	286	293
Gold including platinum-plated, unwrought and semimanufactures troy ounces	16,545	3,846
Iron and steel:		
Metal:		
Pig iron, ferroalloys, similar materials	894	729
Steel, primary forms	146	441
Semimanufactures	126,938	81,348
Lead:		
Oxides	152	152
Metal including alloys, unwrought and semimanufactures	395	97
Nickel including alloys, all forms	12	12
Platinum-group metals and silver metals, including alloys:		
Silver troy ounces	265,095	185,437
Other silver and platinum-group metals, not differentiated value	r $17,691	$274
Tin including alloys, unwrought and semimanufactures	597	488
Titanium oxides	215	120
Zinc including alloys, unwrought and semimanufactures	450	287
Other:		
Unspecified metalliferous ores and metal scrap value	r $115,324	$1,818
Metallic oxides of an unspecified nature	111	108
Nonferrous metals, n.e.s value	r $30,300	$30,495

See footnotes at end of table.

Table 3.—Cyprus: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS		
Abrasives, natural, n.e.s., grinding and polishing wheels and stones ---value--	r $114,070	$94,382
Barite and witherite	43	38
Cement	9,470	6,637
Chalk	741	365
Clays and clay products (including all-refractory brick):		
Crude clays, n.e.s	310	193
Products:		
Refractory (including nonclay bricks) ---value--	r $214,109	$310,221
Nonrefractory ---do----	r $1,722,493	$1,607,605
Diamond, gem, not set or strung ---do----	$58,992	$17,495
Diatomite and other infusorial earth	128	42
Fertilizer materials:		
Manufactured:		
Nitrogenous	41,721	10,295
Phosphatic	4,466	650
Potassic	625	1,199
Other including mixed and unspecified	56,328	27,942
Ammonia	119	14
Gypsum and plasters	63	37
Lime	19	1,498
Pigments, mineral, natural, crude	4,698	898
Precious and semiprecious stones, except diamond:		
Natural ---value--	r $47,276	$21,826
Manufactured ---do----	r $29,113	$18,066
Salt and brine	476	349
Sodium and potassium compounds, n.e.s	514	373
Stone, sand and gravel, dimension stone ---value--	r $289,914	$272,730
Sulfur:		
Elemental, other than colloidal	2,773	853
Sulfur dioxide	93	121
Sulfuric acid	357	253
Talc, steatite, soapstone, pyrophyllite	313	4,220
Other:		
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals, n.e.s ---value--	r $1,327,208	$1,955,520
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	506	264
Coal, all grades, including briquets	131	50
Coke and semicoke	569	309
Peat, including peat briquets and litter	30	3
Petroleum:		
Crude and partly refined ---value, thousands--	r $15,890	$35,408
Refinery products:		
Gasoline, including natural ---thousand 42-gallon barrels--	260	163
Kerosine and jet fuel ---do----	234	162
Distillate fuel oil ---do----	20	3
Residual fuel oil ---do----	709	723
Lubricants ---do----	61	49
Other:		
Liquefied petroleum gas ---do----	130	113
Mineral jelly and wax ---do----	2	1
Nonlubricating oils, n.e.s ---do----	(1)	(1)
Bitumen and other residues ---do----	(1)	(1)
Bituminous mixtures, n.e.s ---do----	8	5
Unspecified ---value--	r $34,289	$36,328
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ---do----	r $21,055	$67,537

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Chromite.—Hellenic Mining Co., Ltd. (HMC), remained the only chromite producer in the country, with a production of about 28,000 tons in 1975. HMC drilled several underground holes, a total footage of 1,854 feet, primarily for exploration purposes. No new findings were reported by yearend. The export of chromite totaled 27,700 tons, mainly to Europe with small quantities to the Japanese market.

Copper.—After 60 years of successful operation, CMC was out of the mining picture in Cyprus. No final decisions by the Government were made on the company's properties, which are in both the north and the south of the island.

HMC continued work in all its mines—Mousoulos underground mine, Mavridhia opencast mine, Kokkinoyia underground mine, and Mathiatis open pit. Geophysical and geochemical surveys on mining leases and prospecting permits were followed by drilling. The results were encouraging, and HMC prepared to start opencast mining at Pirekliashia with stripping to begin in 1976.

NONMETALS

Asbestos.—Cyprus Asbestos Mines Ltd. operated intensively during the dry season and continued work on a larger scale than usual during the winter months with the help of a drying plant. Exports of both short- and long-fiber asbestos to most European countries continued, but showed a 22% decrease in 1975 compared with 1974 levels. The expansion of the processing mill which began in 1974 continued during 1975, and full production was expected in 1976.

Cement.—Cyprus Cement Co. Ltd. and Vassiliko Cement Works Ltd. were the leading cement producers in 1975. Total production of cement reportedly was about 617,000 tons. Most of the production was not utilized locally because of lack of activity by the construction industry. Vassiliko Cement Works secured a 4-million-ton cement contract with Syria during the first quarter of the year. This contract considerably reduced Vassiliko's financial burden, and the new plant capacity which Vassiliko had added in previous years was fully utilized.

Fertilizers.—A discussion at the Ministerial Council level was held in midyear to consider construction of a fertilizer complex in Cyprus. To this end, representatives of HMC were invited to visit and observe several fertilizer complexes in the Soviet Union. Information about the location, size, and financing of such a complex was not published by yearend.

Gypsum.—United Gypsum Ltd. produced a record 23,000 tons of crude gypsum, an 80% increase, in 1975; calcined gypsum production remained the same as in 1974. The increase was not due to a flourishing construction industry in the country but to the increase in cement production, which gave a direct boost to the sagging gypsum mining of 1974. Limassol Chemical Products continued quarrying gypsum rock in 1975, mostly for the company's internal consumption.

Lime.—In 1975 lime production, calcined or byproduct, was the lowest of the last 5 years, owing to a lack of construction on the island. The Akamas Lime Co.'s modern new kiln, situated near the Limni mine, produced at full capacity; production at the locations of Kythria Lime Co. was unpublished at yearend.

Pyrite.—Iron pyrite production in the south totaled about 69,000 tons in 1975, an increase of 20% compared with 1974 output. The increase was attributed to renewed European interest in Cyprus pyrite, which is high in sulfur content. Despite HMC's exploration efforts, no new pyrite deposits were reported.

MINERAL FUELS

No legislation on offshore oil drilling was enacted during 1975. The fate of this legislation, under the present political circumstances, remained uncertain.

Cyprus Petroleum Refinery Ltd. (CPR) produced about 338,000 tons of refinery products in 1975, a 20% decrease from 1974 production. Crude petroleum imports totaled about 338,400 tons, a 30% decrease compared with 1974 imports. Crude petroleum imports in declining order of magnitude were from Iraq, Saudi Arabia, and Syria; limited amounts were received from Iran and Libya. To overcome the refinery product shortage, the Government imported motor gasoline from Italy, Belgium, and the Netherlands; jet fuel from Belgium and the United Kingdom; and fuel oil from the U.S.S.R. and the United States.

The Mineral Industry of Czechoslovakia

By Tatiana Karpinsky [1]

In 1975, Czechoslovakia accounted for about 1.9% of the world's industrial production, 3.7% of world coal output, 2.2% of steel production, and 2.9% of the machine building industry. Czechoslovak output of ferroalloy castings in 1975, ranked 12th in the world and accounted for 1.5% of the world total. Foundries continued to be one of the most important branches of Czechoslovakia's industry.

According to Czechoslovak sources, 1975 national income increased 6% over that of 1974, reaching 413,000 million Czechoslovak korunas.[2] Gross industrial production increased 7% in 1975 and contributed 61% of the national income and supplied more than 85% of Czechoslovak overall exports. Agricultural production in 1975, decreased 0.7% compared with that of 1974. According to Czechoslovakia's Federal Statistical Office, capital investment increased 7.9% in 1975 over that of 1974. However, Czechoslovakia's overall growth rate remained among the lowest in Eastern Europe and was expected to decrease during 1976–80. In 1975, for the second consecutive year, Czechoslovakia had substantial overall trade deficits with both its CMEA[3] and market economy trading partners. Like some other CMEA-countries, Czechoslovakia has typically reserved two-thirds of its total international trade for centrally planned economy countries. In Czechoslovakia there are large reserves of coal, lignite, antimony, magnesite, mercury, uranium, graphite, kaolin and other clays, glass sand, limestone, and building materials, but the country remains deficient in oil, natural gas, iron ore, and nonferrous ores.

In 1975, Czechoslovakia participated in many multilateral investment projects of CMEA countries. These projects included construction of an asbestos production and processing complex in the Soviet Union; gas pipeline construction from Orenburg to the western Soviet frontier (2,750 kilometers long); construction of a 750-kilovolt transmission line from Vinnitsa (U.S.S.R.) to the Hungarian border; and many others.

Czechoslovakia's share in the construction of the asbestos complex was about 3% of the total project investment cost. In return, Czechoslovakia is to obtain asbestos deliveries totaling 7,000 tons in 1980; about 12,000 tons in 1981; and as much as 14,000 tons of asbestos per year between 1982 and 1991. For Czechoslovakia's participation in construction of the gas pipeline, the country is to receive 2,800 million cubic meters of natural gas for a period of 20 years beginning in 1978. Czechoslovakia's share in the construction of a high-voltage line from Vinnitsa to Alberirsa in Hungary was about 10% of the total project cost which is to be repaid with electricity deliveries to Czechoslovakia in 1978. In the field of nuclear power generation, Czechoslovakia will be producing equipment for the 440-megawatt-capacity Voronezh type nuclear powerplant.[4]

Government Policies and Programs.—According to the "Directives on the Economic and Social Development of Czecho-

[1] Foreign mineral specialist, International Data and Analysis.

[2] Official exchange rate for Czechoslovak korunas (Kcs) to U.S. dollars was 5.97Kcs=US$1.00 (October 1975).

[3] CMEA—Council for Mutual Economic Assistance comprises the following countries: Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.

[4] Czechoslovak Foreign Trade, No. 4, 1976, p. 39.

slovakia in 1976–1980," approved by the 15th Congress of the Communist Party of Czechoslovakia in April 1976, the basic economic policy target for the sixth 5-year plan is to increase industrial production and improve the efficiency of industrial output; to develop agricultural production; and to expand new construction. The new 5-year plan foresees an increase in national income of 29%.[5] The plan also calls for a 34% increase in gross industrial output, with a 48% to 51% growth in the heavy industry sector and a 25% increase in output of consumer products. Exports of heavy industry products are anticipated to increase 47% to 49%.

Czechoslovakia's coal and lignite will remain the basic source of energy; total coal output is to reach 122 million to 125 million tons by 1980. Production of coke is to reach about 11 million tons. The generation of electric energy in 1980 is to reach 79 billion kilowatt-hours; about 3,500 to 4,000 megawatts of new generating capacity are to be added during the 5-year period. The ferrous industry is to be expanded and modernized. Pig iron production is to reach 10.5 million tons per year and steel output is to exceed 16 million tons. The output of rolled products is to reach 11.5 million tons.

The plan calls for a 36% to 39% rise in production by 1980 in the chemical industry. Main development emphasis will be placed on oil refining capacity and petrochemicals. A total of 20 million to 21 million tons of crude oil is expected to be processed in 1980.

In the machine-building industry, the 5-year plan foresees development and manufacture of complex technological units for surface mining; development of a belt haulage system for lignite; and manufacture of nuclear power stations, rolling mills, and chemical industry equipment. The plan also foresees manufacture of high-capacity units for the production of cement and equipment for purification, liquefaction, and storage of natural gas.

PRODUCTION

Coal is important to Czechoslovakia since it is the major industrial fuel. Although the total output of bituminous coal, lignite and brown coal increased 5.2 million tons since 1970 reaching 115.1 million tons in 1975, the increase centered on brown coal output which rose 5.5 million tons reaching 83.5 million tons or 72.5% of total output in 1975.

The output of bituminous coal and lignite, for the same period of time, remained steady at approximately 28 million tons and 3.6 million tons, respectively. In 1975 brown coal production increased 5.5% over that of 1974.

Production of iron ore in 1975 (1.8 million tons) remained far below expanding national requirements; the increases in output of iron, steel, and steel products compared with 1974 were as follows: Pig iron, 4.3%; crude steel, 5%; rolled products, 4.4%; and steel tubes, 3.9%.

In 1975, the ferrous metallurgy industry concentrated on completing construction of the East Slovak Iron Works at Kosice, modernization of rolling mills at the Trinec iron works, construction of a new plant for high-grade steel production at Kladno Na Drini, and expansion of capacities for the manufacture of steel pipe. Also, there was an improvement in the efficient utilization of metal scrap. In 1975, Czechoslovakia's sources of steel scrap increased by 10% over the 1974 level and progress was achieved in powder metallurgy.

In 1975, total production of refined copper from domestic and imported ore amounted to 22,824 tons. About 75% of domestic copper ore came from Slovakia. It was estimated that copper ore production from existing deposits at Slovinky, Hodrusa, and Spania Dolina[6] can be doubled by 1985.

Lead and zinc ore production for 1975 was 562,000 tons (10,000 tons more than in 1974). This ore was mined at the Pribram and the Kutna Hora deposits. In 1975, the total production of refined lead from domestic and imported ore was 18,000 tons.

Crude oil production was about 142,000 tons in 1975 and could not meet the national demand which required an additional 15.8 million tons of crude oil, imported mostly from U.S.S.R. Domestic

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[5] Rude Pravo, Special Supplement, Apr. 21, 1976.
[6] Rude Pravo, June 19, 1975, p. 3.

oil was produced mainly in Southern Moravia. Efforts to increase production were reflected in intensive prospecting work in Moravia. Drilling was done to a depth of 3,742 meters near Gottwaldow, 3,321 meters around Nemoicky, and 2,532 meters at Tesany. Prospecting work continued also in Slovakia. The output of natural gas was 852 million cubic meters.

In 1975, a new refinery at Kralupi on Vlata processed its first million tons of Soviet oil. It produced special grades of gasoline, light and heavy lubricants, and motor oil.

In the nonmetallics group Czechoslovakia produced about 22 million tons of limestone, 0.5 million tons of kaolin, 0.7 million tons of magnesite, and 9.3 million tons of cement.

Cement output increased 3.8%, one-half of the 1974 level. In 1975, development of a new cement works was started at Prachovice in Bohemia, with a projected capacity of 1.2 million tons per year. The works were scheduled to reach full capacity by 1980.

The first Czechoslovakian nuclear plant, the Jaslovske Bohunice, with a power generating capacity of 110 megawatts, continued to operate in 1975. Construction and installation work were in progress for three additional stages of a plant to start commercial operation in 1977.[7]

According to Czechoslovak sources, during the 5-year period (1971–75) the national income of the country increased 31.7%. Production of coal, chemicals, and power failed to meet the 5-year plan targets.[8] Instead of the planned 62,000 million kilowatt-hours of electricity for 1975, only 59,200 million kilowatt-hours were generated. The 5-year plan goal set for the crude oil processing industry also was not met. In ferrous metallurgy and in fertilizer production, the overall objectives of the fifth 5-year plan were met.[9]

The index of industrial production increased as follows with 1970=100.

[7] Nuclear News Buyers Guide. V. 13, No. 3, February 1976, p. 53.
[8] Rude Pravo, Jan. 27, 1976.
[9] Work cited in footnote 5.

	1970	1974	1975
General industrial production	100	129	138
Mining	100	114	118
Manufacturing	100	130	140
Electricity and gas	100	125	132

Source: United Nations. Monthly Bulletin of Statistics. V. 30, No. 9, September 1976.

Table 1.—Czechoslovakia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum:			
Alumina [e]	[r] 100,000	100,000	100,000
Aluminum ingot, primary only	[r] 47,646	49,844	43,321
Antimony:			
Mine output, metal content [e]	700	750	750
Metal [e]	1,300	1,400	1,400
Copper:			
Mine output, metal content	4,500	4,700	[e] 5,000
Smelter	7,000	6,000	7,000
Refined including secondary	17,840	20,848	22,824
Iron and steel:			
Iron ore:			
Gross weight thousand tons	1,672	1,688	1,773
Metal content do	502	506	532
Pig iron and ferroalloys:			
Pig iron do	8,507	8,870	9,253
Blast furnace ferroalloys do	27	34	28
Electric furnace ferroalloys do	122	127	132
Crude steel do	13,158	13,640	14,323
Steel semimanufactures (includes castings and forgings) do	[r] 9,567	9,968	10,411
Lead:			
Mine output, metal content	4,683	3,896	4,105
Metal including secondary	16,724	17,870	18,447

See footnotes at end of table.

Table 1.—Czechoslovakia: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS—Continued			
Manganese ore, gross weight [2]	1,000	973	999
Mercury ... 76-pound flasks	6,498	5,541	5,918
Nickel metal, primary [e]	1,200	1,500	1,700
Silver [e] ... thousand troy ounces	1,300	1,300	1,300
Tin:			
Mine output, metal content	[r] [e] 153	143	[e] 176
Metal including secondary	90	120	107
Zinc, mine output, metal content	[r] 8,986	9,340	8,925
NONMETALS			
Barite [e]	7,500	7,500	7,500
Cement, hydraulic ... thousand tons	8,381	8,967	9,305
Clays, kaolin ... do	450	484	526
Fertilizer materials, manufactured:			
Nitrogenous, nitrogen content	350,672	405,386	446,135
Phosphatic:			
Thomas slag, P_2O_5 content	2,826	2,848	1,684
Other, P_2O_5 content	333,552	353,165	396,436
Fluorspar [e]	90,000	90,000	90,000
Gypsum and anhydrite, crude ... thousand tons	578	629	637
Lime (quicklime and hydrated lime) ... do	2,634	2,788	2,959
Magnesite, crude ... do	584	634	662
Perlite [e]	10,000	10,000	10,000
Pyrite:			
Gross weight ... thousand tons	290	296	149
Sulfur content [e] ... do	122	124	63
Salt ... do	[r] 228	227	230
Sodium carbonate, manufactured ... do	122	112	121
Stone, limestone and other calcareous ... do	[r] 19,608	20,693	21,580
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [e]	[r] 30,000	[r] 30,000	30,000
Coal:			
Bituminous ... thousand tons	27,669	27,891	28,007
Brown ... do	78,237	79,171	83,535
Lignite ... do	3,592	3,619	3,551
Total ... do	109,498	110,681	115,093
Coke:			
Metallurgical ... do	9,165	9,306	9,234
Unspecified [3] ... do	1,666	1,592	1,676
Total ... do	10,831	10,898	10,910
Fuel briquets (from brown coal) ... do	1,320	1,307	1,441
Gas:			
Manufactured, all types ... million cubic feet	277,289	274,394	278,879
Natural, marketed [4] ... do	36,798	34,432	30,088
Petroleum:			
Crude:			
As reported ... thousand tons	171	149	142
Converted ... thousand 42-gallon barrels	1,160	1,011	963
Refinery products: [5]			
Gasoline ... do	11,433	11,509	12,172
Kerosine ... do	2,255	2,062	2,302
Distillate fuel oil ... do	27,863	26,766	28,303
Residual fuel oil ... do	[r] 43,476	47,626	52,661
Lubricants ... do	[r] 2,345	2,366	2,485
Other:			
Liquefied petroleum gas ... do	1,322	1,427	1,485
Asphalt and bitumen ... do	7,636	7,539	7,842
Paraffin wax ... do	134	102	126
Total [5] ... do	[r] 96,464	99,397	107,376

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

[1] In addition to the commodities listed, arsenic, gold, feldspar, graphite, uranium, and a variety of 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 manganese.

[3] Derived by subtracting reported metallurgical 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

In 1975, Czechoslovakia's foreign trade turnover (exports plus imports) amounted to 97,367 million korunas, an increase of 14.3% over that of 1974.[10]

In 1975, total exports were valued at 46,651 million korunas, an increase of 13.2% over that of 1974; the total value of Czechoslovakia's imports increased to 50,716 million korunas, an increase of 15.3 compared with the 1974 level.

The trade balance showed that the deficit increased from 2,761 million korunas in 1974 to 4,065 million korunas in 1975.

In 1975, exports of machinery and equipment contributed 48.0% of the total national export value; fuels, mineral raw materials, and metals, 19.6%; chemical products, 4.8%; construction materials, 2.2%; and other products, about 25.4%. The import value of machinery and equipment amounted to 36.9% of the total import value; fuels, mineral raw materials, and metals, 28.8%; chemical products, 8.5%; construction materials, 1.0% and other products, 24.8%.[11]

The main purchasers of machinery and equipment exports were centrally planned economy countries, whose share of total Czechoslovak exports was more than 80%, almost half of which went to the Soviet Union.[12] The share of the developing market economy countries was almost 10% and that of developed market economy countries almost 7%. About 75% of machinery and equipment imports came from CMEA-countries.[13]

The biggest trading partner of Czechoslovakia was the Soviet Union and its share of total Czechoslovak trade turnover increased from 28.5% in 1974 to 32.5% in 1975. Czechoslovakia's exports to the U.S.S.R. increased 25.5%, while imports increased 35.7%. Thus, the 1975 balance of trade with the U.S.S.R. ended with a deficit amounting to 889 million korunas. The second ranking trading partner was East Germany with 12% of the total trade turnover and the third, Poland with 9%.

Czechoslovak trade turnover with the United States in 1975 had a deficit of 576 million korunas, resulting from 756 million korunas of imports and 180 million korunas of exports.[14]

Czechoslovakia, which is dependent on the Soviet Union for its oil supplies, is to obtain 90% of its oil imports in the next 5 years from the U.S.S.R.[15] The prices paid for Soviet oil increased 175% from 1973 to 1975[16] and increased the deficit of Czechoslovakia's balance of trade with the U.S.S.R. in 1975.

Under the 1975 agreement between Czechoslovakia and the U.S.S.R., equipment for the 440-megawatt-capacity Voronezh type nuclear powerplant will be delivered to the U.S.S.R. by Slovakian Power Engineering Works (SES). SES will build machinery for Czechoslovak and Soviet nuclear power engineering according to Soviet documentation.

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[10] Facts on Czechoslovak Foreign Trade. Chamber of Commerce of Czechoslovakia, 1976, p. 39.
[11] Page 45 of work cited in footnote 10.
[12] Svet Hospodarstvi (World Economics). No. 31, Mar. 12, 1976.
[13] Svet Hospodarstvi (World Economics). No. 32, Mar. 16, 1976.
[14] Page 77 of work cited in footnote 10.
[15] The Journal of Commerce (New York), Feb. 18, 1976.
[16] The Journal of Commerce (New York), Mar. 26, 1975.

Table 2.—Czechoslovakia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal destinations, 1974
METALS			
Aluminum:			
Oxide and hydroxide	--	251	All to Austria.
Metal and alloys:			
Scrap	2,454	2,143	Austria 1,419; West Germany 627.
Unwrought and semimanufactures [3]	14,731	11,719	France 2,735; Poland 2,646; Switzerland 2,406.
Copper metal and alloys:			
Scrap	287	866	Mainly to West Germany.
Unwrought and semimanufactures [3]	6,027	6,168	Poland 2,647; West Germany 3,499.

See footnotes at end of table.

Table 2.—Czechoslovakia: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973[1]	1974[2]	Principal destinations, 1974
METALS—Continued			
Iron and steel:			
Ore and concentrate	42,288	73,916	All to Austria.
Roasted pyrite	9,234	9,369	Do.
Scrap[3] thousand tons	214	180	Poland 153; Austria 14.
Pig iron including cast, powder and shot do	33	35	Yugoslavia 21; Italy 10.
Ferroalloys do	23	20	West Germany 11; Italy 2; Austria 2.
Steel, primary forms[3] do	306	384	Yugoslavia 133; West Germany 94; Poland 80.
Semimanufactures:			
Bars, rods, angles, sheets, sections[4] do	1,113	1,111	East Germany 153; Poland 138; Yugoslavia 106.
Plates and sheets[4] do	787	875	West Germany 175; U.S.S.R. 165.
Hoop and strip[4] do	210	243	Yugoslavia 74; Poland 37; Lebanon 26.
Rails and accessories[4] do	13	14	Romania 7; East Germany 3; Bulgaria 2.
Wire[4] do	93	90	West Germany 32.
Pipes and tubes[4] do	478	445	U.S.S.R. 325.
Castings[3] do	16	20	Mainly from Poland.
Total do	2,710	2,798	
Lead:			
Ore and concentrate	8,885	7,079	All to Belgium-Luxembourg.
Metal and alloys:			
Scrap	NA	92	All to West Germany.
Unwrought and semimanufactures	1,070	NA	
Magnesium metal and alloys:			
Scrap	3,639	658	All to West Germany.
Unwrought and semimanufactures	27,526	85	Do.
Manganese oxides	--	20	All to Spain.
Nickel:			
Ore and concentrate	--	138	All to United Kingdom.
Metal and alloys:			
Scrap	591	478	All to West Germany.
Unwrought	64	143	United Kingdom 106; West Germany 37.
Platinum-group metals:			
Unworked and partly worked value, thousands	$406	$371	All to West Germany.
Waste and sweepings do	$178	--	
Tin ore and concentrate	NA	169	Spain 144; United Kingdom 25.
Titanium oxides	5,341	4,629	Italy 1,010; France 695; Switzerland 610.
Tungsten ore and concentrate	152	145	All to West Germany.
Zinc:			
Ore and concentrate	11,048	17,334	Yugoslavia 8,235; Belgium-Luxembourg 7,141; West Germany 1,958.
Oxide	1,672	1,270	West Germany 409; Sweden 275; France 203.
Metal:			
Scrap	NA	337	All to West Germany.
Unwrought and semimanufactures	2,688	243	United Kingdom 125; West Germany 68; Belgium-Luxembourg 50.
Other, n.e.s.:			
Ash and other nonferrous base metal bearing residues	1,669	1,956	Austria 1,454; Italy 258; Belgium-Luxembourg 244.
Metal, all forms	215	139	Spain 89; West Germany 49.
NONMETALS			
Abrasives:			
Pumice, emery and other natural abrasives	266	--	
Grinding stones	NA	300	West Germany 124; Italy 76.
Barite	20,606	594	Austria 449; Yugoslavia 145.
Cement, hydraulic[5] thousand tons	101	149	Hungary 77; West Germany 20.
Clays and clay products:			
Crude:			
Fuller's earth[3] do	r 5	--	
Kaolin[5] do	266	297	West Germany 88; Poland 44; Austria 30.
Unspecified do	490	511	West Germany 233; Austria 64; Italy 58.

See footnotes at end of table.

Table 2.—Czechoslovakia: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1972 [2]	Principal destinations, 1974
NONMETALS—Continued			
Clays and clay products—Continued			
Products:			
Nonrefractory ------thousand tons--	38	30	Yugoslavia 10; West Germany 7; Austria 7.
Refractory [6] ------do----	r 72	158	Hungary 66; West Germany 57.
Diamond, gem and industrial value, thousands--	NA	$33	All to Belgium-Luxembourg.
Diatomite and other infusorial earth --------	--	483	Mainly to Netherlands.
Fertilizer materials:			
Manufactured: Nitrogenous [6] ------------	10,030	144,620	All to Hungary.
Ammonia ------------------------	4,564	63,150	Yugoslavia 20,421; Austria 18,705; West Germany 13,225.
Gem stones precious and semiprecious, except diamond ---------value, thousands--	NA	$150	West Germany $39; Canada $38; Yugoslavia $28.
Graphite ------------------do----	NA	$31	NA.
Magnesite [5] -----------thousand tons--	204	400	West Germany 93; Hungary 72; Poland 64.
Mica, all forms ------------------------	78	142	West Germany 45; Yugoslavia 34; Italy 25.
Pigments, iron oxides ------------------	1,713	1,870	Italy 1,340; Sweden 234; Spain 151.
Sodium and potassium compounds:			
Caustic soda ------------------------	195	445	West Germany 152; Yugoslavia 142; Switzerland 79.
Caustic potash ----------------------	316	1,001	Yugoslavia 422; Italy 298; Austria 162.
Soda ash ----------------------------	9,499	13,500	Yugoslavia 8,488; Italy 3,650; West Germany 1,362.
Stone, sand and gravel:			
Dimension stone crude and worked-------	44,476	33,842	Mainly to West Germany.
Gravel and crushed rock ---------------	NA	7,724	All to West Germany.
Sand [5] ----------------------------	49,993	139,218	Austria 75,657; Hungary 63,561.
Sulfur, elemental ---------------------	1,997	NA	
Talc [3] ------------------------------	4,309	4,798	All to Poland.
Other nonmetals, n.e.s.:			
Slag, dross and waste not metal bearing--	NA	46,794	Mainly to West Germany.
Unspecified --------------------------	4,331	7,199	West Germany 4,861; Austria 2,338.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black --------------------------	738	NA	
Coal: [5]			
Bituminous -----------thousand tons--	3,480	3,717	Austria 717; East Germany 710; Romania 632.
Lignite ------------------do----	1,265	1,391	Mainly to West Germany.
Coke and semicoke [5] ------------do----	2,573	2,519	East Germany 801; Austria 703; Romania 472.
Petroleum:			
Partly refined--thousand 42-gallon barrels	441	30	All to Yugoslavia.
Refinery products:			
Gasoline ------------------do----	1,443	941	Austria 863.
Distillate fuel oil [5] ---------do----	2,620	1,196	Switzerland 640; West Germany 505.
Residual fuel oil ------------do----	NA	--	
Lubricants ----------------do----	22	17	Austria 13; Yugoslavia 3.
Other:			
Liquefied petroleum gas --do----	NA	52	France 46; Austria 6.
Mineral jelly and wax ----do----	--	19	Italy 8; France 5; West Germany 3.
Nonlubricating oils, n.e.s--do----	634	82	Mainly to West Germany.
Pitch and pitch coke -----do----	--	511	West Germany 352; France 63.
Bitumen and other residues do----	--	140	Mainly to West Germany.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals -----------	41,864	39,294	West Germany 23,640; Italy 5,320.

r Revised. NA Not available.

[1] Compiled from the World Trade Annual, 1973, Walker and Co., New York, 1975.

[2] Compiled from the Supplement to the World Trade Annual, 1974, Walker and Co., New York, 1976.

[3] Source: Official Polish Trade Statistics.

[4] Statistics of World Trade in Steel, 1973 edition and 1974 edition, United Nations, New York, 1974, 1975.

[5] Source: Official Czechoslovakian Trade Statistics.

[6] Source: Official Hungarian Trade Statistics .

Table 3.—Czechoslovakia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal sources, 1974
METALS			
Aluminum:			
Alumina [3]	9,120	12,127	Hungary 11,926.
Bauxite and concentrate [4] thousand tons	449	432	Hungary 266; Yugoslavia 144.
Metal and alloys:			
Scrap	2,591	1,714	Austria 1,166; West Germany 548.
Unwrought [5]	98,102	106,165	U.S.S.R. 97,632; Yugoslavia 7,517.
Semimanufactures [5]	24,485	25,975	Yugoslavia 14,398; U.S.S.R. 10,362.
Cadmium metal, all forms [4]	249	268	U.S.S.R. 193; United Kingdom 44.
Chromium, chromite [4] thousand tons	182	183	U.S.S.R. 104; Albania 58.
Copper:			
Ore and concentrate	5,754	1,685	All from France.
Metal including alloys:			
Unwrought [5 6]	42,047	43,579	U.S.S.R. 38,705; Poland 4,595.
Semimanufactures [6]	22,620	19,633	Poland 8,994; West Germany 4,642; Yugoslavia 4,338.
Iron and steel:			
Ore and concentrate [4] thousand tons	13,211	13,985	U.S.S.R. 11,825; India 624.
Scrap [6] do	8	22	West Germany 12; Poland 10.
Pig iron [4] do	730	802	U.S.S.R. 798.
Ferroalloys [5] do	115	103	U.S.S.R. 102.
Steel, primary forms [6] do	91	155	Mainly from Poland.
Semimanufactures: [7]			
Bars, rods, sections do	97	86	U.S.S.R. 42; Poland 37.
Plates and sheets do	332	211	Poland 89; U.S.S.R. 70; West Germany 33.
Hoop and strip do	8	10	West Germany 4; Austria 3; Poland 2.
Rails and accessories [4] do	47	25	U.S.S.R. 12; Poland 7.
Wire do	3	2	West Germany 1.
Pipes, tubes, fittings do	27	22	West Germany 7; Yugoslavia 4; U.S.S.R. 4.
Castings and forgings do	7	4	Mainly from Yugoslavia.
Total do	521	360	
Lead:			
Oxides	1,349	4,152	France 3,090; Austria 1,012.
Metal including alloys, all forms [4]	35,712	35,000	U.S.S.R. 25,028; Yugoslavia 8,000.
Magnesium metal including alloys, all forms [5]	973	1,695	All from U.S.S.R.
Manganese:			
Ore and concentrate [4] thousand tons	441	475	U.S.S.R. 334; Brazil 34; Ghana 34.
Oxide	NA	100	All from Japan.
Mercury 76-pound flasks	--	203	All from Yugoslavia.
Molybdenum metal including alloys, all forms	2	(8)	All from Austria.
Nickel:			
Ore and concentrate	430	--	
Scrap	197	870	All from France.
Metal including alloys, unwrought and semimanufactures [4]	3,722	4,534	U.S.S.R. 4,092; Cuba 397.
Platinum-group metals including alloys, all forms value, thousands	NA	$842	United Kingdom $529; West Germany $301.
Silver including alloys, all forms do	$4,343	$11,305	Netherlands $4,763; Yugoslavia $3,880; Belgium-Luxembourg $1,576.
Tin:			
Oxides	28	17	All from West Germany.
Metal including alloys, all forms	638	439	United Kingdom 389; Netherlands 50.
Titanium oxides	696	1,137	West Germany 919; United Kingdom 168.
Tungsten:			
Ore and concentrate	--	247	All from Netherlands.
Metal and alloys, all forms	2	3	Mainly from Austria.
Zinc:			
Oxide	NA	97	All from United Kingdom.
Dust (blue powder)	2,249	2,066	Yugoslavia 1,627; Belgium-Luxembourg 439.
Metal and alloys, all forms [5 6]	56,445	56,014	U.S.S.R. 22,844; Yugoslavia 20,426; Poland 10,703.

See footnotes at end of table.

Table 3.—Czechoslovakia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973[1]	1974[2]	Principal sources, 1974
METALS—Continued			
Other:			
Ore and concentrate	789	481	All from Netherlands.
Metals including alloys, all forms:			
Metalloids	1,250	903	All from Norway.
Base metals including alloys	676	169	Mainly from Belgium-Luxembourg.
NONMETALS			
Abrasives, natural, n.e.s.:			
Dust and powder of precious and semiprecious stones ......value, thousands..	$239	$316	Switzerland $253; Netherlands $56.
Grinding and polishing wheels and stones.	341	339	Austria 142; West Germany 137; Italy 34.
Pumice, emery and other natural abrasives	608	611	Italy 501; Belgium-Luxembourg 110.
Asbestos[4]	42,032	38,826	U.S.S.R. 28,488; Botswana 8,281; Canada 1,410.
Barite	830	1,125	All from West Germany.
Cement[4] ......thousand tons..	730	666	U.S.S.R. 475; Romania 136; Hungary 23.
Clays and clay products:			
Crude clays	1,586	2,653	Mainly from West Germany.
Products:			
Nonrefractory	16,668	4,954	Italy 3,866; Greece 521.
Refractory	6,135	6,156	West Germany 3,046; France 1,542; Austria 770.
Diamond:			
Gem ......value, thousands..	$775	$1,018	United Kingdom $966.
Industrial ......do....	$1,520	$2,499	Mainly from Belgium-Luxembourg.
Diatomite and other infusorial earth	1,599	606	All from Iceland.
Feldspar and fluorspar	10,711	6,145	Yugoslavia 3,235; West Germany 2,910.
Fertilizer materials:			
Crude, phosphatic ......thousand tons..	NA	5	All from Austria.
Manufactured:			
Nitrogenous (N content)[4] ....do....	75	50	All from U.S.S.R.
Phosphatic (P_2O_5 content)[4] ...do....	359	387	U.S.S.R. 177; Morocco 88; Tunisia 65.
Potassic[4] ......do....	577	591	East Germany 469; U.S.S.R. 122.
Ammonia	6,038	--	
Gem stones, precious and semiprecious except diamond ......value, thousands..	$57	$118	Switzerland $56; West Germany $34; France $28.
Graphite	268	245	All from West Germany.
Gypsum and plasters[4]	28	27	All from East Germany.
Lime[6]	52,712	35,910	All from Poland.
Magnesite	1,240	2,588	Greece 2,300; Austria 288.
Mica, worked	6	--	
Pigments, mineral, iron oxides	1,365	1,522	All from West Germany.
Pyrite, sulfur content[4] ......thousand tons..	95	57	All from U.S.S.R.
Salt:			
Rock[6]	804,114	31,973	All from Poland.
Brine[5 6]	113,655	112,049	U.S.S.R. 101,456; Poland 10,593.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	46,938	26,348	All from West Germany.
Soda ash[4] ......thousand tons..	116	175	East Germany 60; Romania 52; Poland 27.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked[3]	3,453	26,793	Hungary 20,880; Yugoslavia 5,283.
Worked	NA	1,437	Mainly from Yugoslavia.
Limestone and dolomite[6]	6,837	13,185	All from Poland.
Gravel and crushed rock	2,020	4,140	Mainly from Austria.
Quartz and quartzite	3,780	5,566	All from West Germany.
Sand	NA	61	All from Italy.
Sulfur:			
Elemental, all forms[4] ..thousand tons...	322	329	Poland 196; U.S.S.R. 133.
Sulfur dioxide	320	376	All from West Germany.
Sulfuric acid[4] ......thousand tons..	75	76	U.S.S.R. 59; Poland 17.
Other, unspecified crude nonmetals:			
Slag, dross, etc	3,783	6,710	All from Austria.
Crude, n.e.s	NA	476	All from United Kingdom.
Oxides of strontium, barium and magnesium	361	410	France 266; West Germany 144.

See footnotes at end of table.

Table 3.—Czechoslovakia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [5]	22,959	19,230	U.S.S.R. 14,133; France 3,090.
Coal and briquets: [4]			
Anthracite and bituminous coal thousand tons	5,299	5,168	U.S.S.R. 2,747; Poland 2,421.
Lignite briquets do	580	546	All from West Germany.
Coke and semicoke [5] do	21	76	All from U.S.S.R.
Gas, natural [5] million cubic feet	83,438	114,101	Do.
Hydrogen, helium and rare gases	42	4	France 2; West Germany 2.
Petroleum:			
Crude [5] thousand 42-gallon barrels	104,137	107,714	U.S.S.R. 105,039.
Refinery products:			
Gasoline do	360	60	Mainly from West Germany.
Kerosine and jet fuel do	8	5	All from Yugoslavia.
Distillate do	NA	3	Yugoslavia 2; West Germany 1.
Lubricants do	335	364	Austria 330.
Residual fuel oil do	1,468	311	West Germany 238; Austria 73.
Other:			
Liquefied petroleum gas do	273	304	Austria 223; West Germany 80.
Mineral jelly and wax do	4	6	Mainly from West Germany.
Petroleum coke do	49	44	All from West Germany.
Unspecified do	43	20	West Germany 16; Austria 3.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	9,428	--	

[r] Revised. NA Not available.
[1] Compiled from the World Trade Annual, 1973, Walker and Co., New York, 1975.
[2] Compiled from the Supplement to the World Trade Annual, 1974, Walker and Co., New York, 1976.
[3] Source: Official Hungarian Trade Statistics.
[4] Source: Official Trade Statistics of Czechoslovakia.
[5] Source: Official Trade Statistics of U.S.S.R.
[6] Source: Official Polish Trade Statistics.
[7] Source: Statistics of World Trade in Steel, 1973 edition and 1974 edition, United Nations, New York, 1974, 1975.
[8] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—Production of primary aluminum in Czechoslovakia totaled 43,000 tons in 1975, a decrease of 13.1% below the 1974 level; consumption of aluminum was 170,000 tons in 1975. Czechoslovakia imported 313,000 tons of bauxite from Hungary and 138,000 tons from Yugoslavia in 1975. About 80,000 tons of aluminum came from the U.S.S.R. and 12,000 tons from Yugoslavia. In 1975 total imports of alumina increased by 4.4% over that of 1974 and imports of aluminum decreased 24.4%.[17]

In 1976 Yugoslav deliveries of primary aluminum to Czechoslovakia are to increase 25% as compared with 1975. The most important goal of the sixth 5-year plan (1976–80) in the aluminum industry is the intensification and modernization of production of alumina and aluminum at the Slovak National Aluminum Works at Ziar. It is planned to obtain alumina from Guyana in exchange for technical aid in constructing an aluminum smelter.

Antimony.—In 1975, mine production of antimony, metal content, was about 750 tons. Two mining centers, Dubravy and Pezinek, were in operation. Plans through 1990 emphasize the need to modernize and increase the productive capacities of existing mining and ore-processing units. Two additional sections are to be set up near Dubravy and Krasne Hory in the near future. Czechoslovakia eventually expects to export antimony by 1990.[18]

The antimony plant in Bolivia, constructed with Czechoslovak assistance, was put into operation by the end of 1975. Capacity of the new Bolivian plant is 5,000 tons antimony and 1,000 tons antimony oxide (Sb_2O_3) per year.

Copper.—Czechoslovakia's copper ore production increased from 667,000 tons in 1974 to 669,000 tons in 1975, or 0.3%.

Domestic mine production of copper totaled 5,000 tons in 1975 and has maintained the same approximate level for the

[17] Pages 59 and 60 of work cited in footnote 10.
[18] Eastwest Markets, Sept. 20, 1976, p. 12.

last 2 years. Total refined copper production amounted to 22,824 tons in 1975. The U.S.S.R. copper deliveries totaled 36,000 tons and Polish deliveries 12,000 tons in 1975.[19] Imports of copper from Great Britain totaled 5,000 tons in 1975.

Deposits of copper ore occur in conjunction with iron ores at Rudnany (Slovakia) and near Roznava (Slovakia), copper-lead-zinc ores in Banska Stiavnica (Slovakia), and copper ores in the Zlote Hory (Moravia).[20] Copper mining is to be expanded at the Zlote Hory deposit in Moravia and at other mines. New investments are planned in Zlote Hory, Tisova, Slovinsky, Gelnica, Hovoveska Huta, Spania Dalina, and Zlatno. Copper production is expected to rise considerably over the next 15 years.

Iron and Steel.—In 1975, Czechoslovakia produced 1.8 million tons of iron ore,[21] or 6% above that of 1974 and 13% above the 1970 output level. In 1975, about 12 million tons of iron ore were imported from the Soviet Union and 2.1 million tons from other countries (Brazil, Liberia, India, Sweden, and Algeria). Reportedly, Czechoslovakia signed a contract for delivery of 65,000 tons of iron ore pellets from Norsk Jernverk to upgrade blast furnace feed.

The country's iron ore deposits are located in the Slovak Ore Mountains and in Central Czechoslovakia. It is estimated that total reserves of iron ore in Czechoslovakia approximate 400 million tons with an average content of 30% to 35% iron.[22] The siderite deposit at Rudnancy (Slovakia) continued to be the main local source of iron ore.[23] Production of iron ore is not likely to increase much in the future. However, further prospecting continued in both the Czech and Slovak regions.

In 1975, pig iron production totaled 9.3 million tons, an increase of 4.3% compared with that of 1974 and 23.1% compared with that of 1970. Imports of pig iron reached 1.1 million tons in 1975 an increase of 38.2% over that of 1974. Approximately 21,000 tons of pig iron were exported in 1975.

In 1975, Czechoslovakia produced 14.3 million tons of crude steel, an increase of 5% over the 1974 level. Steel production in Slovakia totaled 3.8 million tons,[24] and was produced almost exclusively at the East Slovak Iron and Steel Works at Kosice. The first stage of this metallurgical works was completed in June 1966 and the second one was put into operation in April 1974.

Czechoslovakia's production of rolled products (excluding pipe) increased 4.5% to 10.4 million tons in 1975; output of steel pipe was 1.45 million tons in 1975, 3.6% more than that of 1974.

In 1975, exports of steel semimanufactures amounted to 3.3 million tons. Exports of different kinds of pipe (casing, oil, thin wall, electric-welded, carbon, etc.) from Czechoslovakia to the U.S.S.R. amounted to about 350,000 tons in 1975.[25]

The plan provided for the production of 9.5 million tons of pig iron, 14.7 million tons of crude steel, 10.2 million tons of rolled products, and 1.4 million tons of steel pipe in 1976.[26]

In 1975, the first 100-ton electric arc furnace at the Kladno Iron and Steel Works was put into operation. The second furnace is to be commissioned in the first quarter of 1976. Two electric furnaces for the production of ferroalloys were put into operation at the Oravsky ferroalloy works at Istebna (Slovakia). A number of other smaller units also became operational in 1975.

During the fifth 5-year plan (1971–75), the ferrous industry concentrated on completing development of the East Slovak Iron Works at Kosice, which produced 3.5 million tons of crude steel in 1975; modernization of rolling mills at the Trinec Iron Works; construction of a new plant for producing high-grade steel at Kladno; expansion of capacities for the manufacture of steel pipe of all types; and the construction of important production lines related to the nuclear program. Some important projects started in 1971–75 are to be completed in 1976–80. This will include construction of an electric steel plant at Kladno, expansion of pipe production, the completion of operations for the nuclear program and the modernization of rolling

[19] Czechoslovak Foreign Trade, No. 5, 1976, p. 11.
[20] Jan Ilavsky. Economic Geology. V. 71, 1976, pp. 423–432.
[21] United Nations. Annual Bulletin of Steel Statistics for Europe. V. 3, 1975, p. 17.
[22] United Nations. Survey of World Iron Ore Resources. 1955, pp. 126–130.
[23] Einecke G. Die Eisenforräte der Welt. Hamburg, 1950, pp. 251–254.
[24] Pravda. January 27 and 28, 1976.
[25] Foreign Trade, Moscow. No. 3, 1976.
[26] United Nations. Economic and Social Council. New York, Steel/WP.1/R.4/Add. 2, Mar. 24, 1976.

mills. In addition, the following new projects are to be carried out during the sixth 5-year plan: (1) Expansion of pipe manufacture facilities at Chomutov and other works; (2) construction of an oxygen steel plant at Trinec with planned production of 2.8 million tons of steel per year and continuous casting installations at the East Slovak Iron Works; (3) construction of a new medium-grade rolling mill at the New Klement Gottwald Metallurgical Works in Ostrava; (4) reconstruction of some coke batteries and of blast furnace No. 1 at the same works; (5) construction of a tube mill at the Sverma Iron Works; and (6) enlargement of the Victovice and Kraluv works.

The sixth 5-year plan anticipates the following production increases by 1980 over the 1975 levels: Pig iron, 15%; crude steel, 13%; rolled products, 16%; and steel pipe, 13%. Labor productivity is to increase 22%.[27]

Lead and Zinc.—Lead and zinc ore production increased to 562,000 tons in 1975 or 1.8%. Production of lead from domestic ores reached approximately 4,000 tons, but the country's consumption of this metal was 54,000. Czechoslovakia's total lead production amounted to 18,000 tons in 1975. In addition, 25,000 tons of lead was imported from the U.S.S.R. and about 6,000 tons from Yugoslavia. The consumption of zinc totaled 60,000 tons. Domestic output totaled only about 9,000 tons. Imports of lead and zinc from the Soviet Union supplied the basic requirements of the Czech industry. In 1975 imports of zinc from the U.S.S.R. amounted to about 22,000 tons; Yugoslavia, 16,000 tons; Bulgaria, 8,000 tons; Poland, 6,000 tons; and West Germany, 6,000 tons. In December 1974, the Association of Yugoslav Lead and Zinc Producers received a credit of $75 million from the Czechoslovak Metalimex Prague Foreign Trade Corporation for the purchase of Czechoslovak goods and services. The credit will be repaid in the form of deliveries of zinc, lead, silver, cadmium, and semifinished and final products from these metals.

Czechoslovakia's lead-zinc ores are mined at Pribram, Kutna Hora, and Banska Stiavnica deposits. Czechoslovakia's mining plans through 1990 emphasize the need to find new reserves of lead-zinc ores and to modernize and increase the productive capacities of existing mining and ore processing facilities.

Tin.—Tin and tungsten were mined in the Cinavec and Horni Slavkov regions. In 1975 Czechoslovakia imported some 4,000 tons of tin, 18% of which came from Malaysia. Plans were made to double imports of tin by 1980.

Uranium.—Data on uranium mining and reserves in 1975 was practically nonexistant because such data are classified. The long-known hydrothermal uranium deposits in the Johymov and Pribram regions were mined intensively since the end of World War II, and by 1975 they were practically depleted. On the basis of surveys in 1960, deposits of radioactive raw material were found in the middle of the Moldanubicum District in Central Bohemia.

In 1973 in addition to the known deposits, a number of promising areas were found.[28] Uranium ore (U_3O_8) production was estimated at 250 tons per year in 1973;[29] however, according to new sources,[30] the annual production was given to be as much as 2,000 tons.

NONMETALS

Cement.—Construction of the Prachovice No. 2 cement plant in Eastern Bohemia, with an annual capacity of 1.2 million tons, was started in 1975. The first stage of this plant is to be put into operation in 1979 and completion of the plant is scheduled for 1980. The operation is to be automated and controlled by computers. Fly ash and waste gases are to be thoroughly retained and processed into fertilizers. In winter, the dry process cement plant at Prahovice is to be fueled by heavy oil, and in summer, by natural gas.[31]

In 1975 Czechoslovakia exported about 106,000 tons of cement to Poland, 58,000 tons to West Germany, 17,000 tons to Hungary, and 5,000 to Yugoslavia. About 386,000 tons of cement were imported from the U.S.S.R. and 133,000 tons from Romania in 1975.

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[27] Hutnicke Listy (Metallurgical Newspaper), Prague. No. 1, 1976, pp. 1–4.
[28] Hornik a Energetik. (Uranium Yesterday, Today and Tomorrow.) No. 47, Nov. 20, 1975.
[29] Analysis of Energy Resources and Programs of the Soviet Union and Eastern Europe. Tech. Rept. RAZC–TR–74–204, December 1973, pp. 57–77.
[30] Glückauf, No. 6, 1976, p. 112.
[31] Czechoslovak Foreign Trade, No. 2, 1976, p. 42.

Feldspar.—Development of feldspar deposits discovered in the Territory of Halamky Community in the area of Jindrichuv continued in 1975. Reserves are estimated at approximately 150 million tons of feldspar. A new plant is to make Czechoslovakia self-sufficient in this mineral.

Fertilizer Materials.—Czechoslovakia's chemical industry produced 446,000 tons of nitrogen and 398,000 tons of phosphatic fertilizers (in terms of nutrient content) in 1975. Production of nitrogen fertilizer increased 10.1% as compared with that of 1974 and phosphatic fertilizer 11.8%.

In 1975, the country consumed 1.5 million tons of fertilizers, an increase of 3.8% compared with the 1974 level; nitrogen fertilizers constituted 31.6%; phosphatic fertilizers 26.3%; and potassium fertilizers 42.1%. The consumption of pure nutrients per hectare of agricultural land reached 222 kilograms. In 1975 Czechoslovak production of fertilizers remained below domestic needs and fertilizers continued to be imported from East Germany and the Soviet Union.

In 1975, the Soviet Union delivered 182,000 tons of potash in form of finished fertilizers and fertilizers to be further processed; 15,000 tons of granulated superphosphates; 158,000 tons of phosphates (P_2O_5); and 47,000 tons of nitrogenous fertilizers. East Germany delivered about 508,000 tons of potassium fertilizers. In addition in 1975 Morocco delivered to Czechoslovakia 102,000 tons of phosphate (P_2O_5), Tunisia, 46,000 tons, and Algeria 33,000 tons. During 1976–80, imports of fertilizers from centrally planned economy countries will increase and are to represent as much as 90% of Czechoslovakia's total fertilizer imports.

Phosphatic fertilizers were produced at the chemical complexes at Lovosice (North Bohemian region), Kolin, and Usti (Central Bohemian Regíon), and Bratislava (West Slovak region) from imported raw materials. Nitrogen fertilizers were produced at the Lovosice-Zaluzi Chemical Complex (North Bohemia), at the new chemical complex at Sala with approximate production of 430,000 tons per year (West Slovakia) and at the chemical complex at Strazske (East Slovakia) which was expanding its production of nitrogen fertilizers.

MINERAL FUELS

Energy.—For many years coal, including brown coal and lignite, has been the major source of primary energy in Czechoslovakia. Production of total energy derived from fossil fuels, hydroelectric, and nuclear generation rose from 79.6 million tons of standard coal equivalent in 1974 to 82.1 million tons in 1975. In 1975, the share of coal (bituminous, brown, and lignite) in the total primary energy production was about 97.9%, the share of crude oil 0.3%, natural gas 1.2%, and nuclear and hydropower 0.6%. Total consumption of primary energy in Czechoslovakia increased from 105.0 million tons in standard coal equivalent in 1974 to 109.8 in 1975. In 1975, coal provided about 72.0% of the total consumption while oil represented 21.4%, natural gas 5.6%, hydroelectric power 0.4%, nuclear power 0.1%, and imported electric power 0.5%.

In 1975, Czechoslovakia produced 59.2 billion kilowatt-hours of electricity, an increase of 5.7% over that of 1974.[32] New facilities with a capacity of 976 megawatts were put into operation in 1975.

The total primary energy balance for 1974 and 1975 is shown in table 4.

Coal.—During 1975 Czechoslovakia produced a total of 28 million tons of bituminous coal, an increase of 0.4% over 1974 production. Bituminous coal production in 1976 is expected to be over 28.2 million tons. Particular attention was to be given to the extraction of coking coal in Northern Moravia in 1976. Total exports of bituminous coal were estimated at 3.7 million tons in 1975. The main importers of the bituminous coal were Austria, East Germany, Romania and Hungary. Imports of bituminous coal by Czechoslovakia was 5.2 million tons in 1975; it was imported from the U.S.S.R. and Poland. The bulk of the country's bituminous coal output came from the Ostrava-Karvin Basin, which forms part of the large Upper Silesia coal deposits. In 1975, Czechoslovakia produced a total of 83.5 million tons of brown coal and 3.6 million tons of lignite. Production of brown coal increased 5.5% over that of 1974, but production of lignite declined by about 2%. In 1976, the total coal and lignite output is expected to reach 116.5 million tons. Reportedly, about 1.7 million

[32] Rude Pravo, Jan. 27, 1976.

Table 4.—Czechoslovakia: Total primary energy balance for 1974 and 1975

(Million tons of standard coal equivalent)[1]

	Total primary energy	Coal (bituminous, brown, lignite) and coke	Crude oil and petroleum products	Natural gas	Hydroelectric power	Nuclear power	Turnover of electric power with other countries
1974:							
Production	79.6	77.6	0.2	1.3	0.4	0.1	--
Exports	6.4	6.2	--	--	--	--	0.2
Imports	31.8	5.2	21.5	4.3	--	--	.8
Apparent consumption	105.0	76.6	21.7	5.6	.4	.1	.6
1975:							
Production	82.1	80.4	.2	1.0	.4	.1	--
Exports	7.0	6.8	--	--	--	--	.2
Imports	34.7	5.5	23.3	5.1	--	--	.8
Apparent consumption	109.8	79.1	23.5	6.1	.4	.1	.6

[1] 1 ton of standard coal equivalent (SCE) = 7,000,000 kilocalories. Conversion factors used are as follows: Hard coal, 1.0; brown coal and lignite, 0.6; crude oil, 1.47; natural gas, 1.33 (per 1,000 cubic meters); hydroelectric and nuclear power, 0.125 (per 1,000 kilowatt hours).

Source: Statistical Yearbook of Czechoslovakia, Prague, 1976.

tons of brown coal were exported in 1975. The principal importer was West Germany. The major part of brown coal output was supplied by the North Bohemian Basin. Coke production reached 10.9 million tons in 1975; coke was produced at the same level as in 1974. About 2.3 million tons of coke were exported mainly to East Germany and Romania.

In 1975, the Most District produced 51% of the total coal output, Ostrava 21%, Sokolov 18%, Prievidza 7%, and Kladno 3%. According to 1967 estimates, hard coal reserves in Czechoslovakia are 11,600 million tons and brown coal reserves about 12,500 million tons. Coking coal accounted for 10.5% of the aggregate reserves of coal of all types.[33]

In 1975 in the Ostrava coal basin, new deep shafts were being sunk in areas with coking coal. During the past 5 years over 500 million tons of coal have been discovered at the southernmost part of the Ostrava-Karvina Basin in North Moravia. This area is to become the center of a new coal mining district and development is to begin in 1978. Coal deposits with estimated reserves of 150 million tons have been discovered at Slany in Central Bohemia where production of coal is to begin in 1978. Coal deposits have been discovered in the Melnik-Benatky area north of Prague where reserves are estimated at 250 million tons.

Natural Gas.—Production of natural gas in 1975 was approximately 852 million cubic meters.[34] Imports of natural gas from the U.S.S.R. amounted to 3,800 million cubic meters, a 15.2% increase over the 3,300 million cubic meters imported in 1974. The U.S.S.R. was the sole source of imported natural gas in 1975. After completion of the Orenburg-Europe gas pipeline, Czechoslovakia is to receive an additional 2,800 million cubic meters of gas per year.[35] The Orenburg pipeline is to carry a total 28,000 million cubic meters of gas per year over a distance of some 2,750 kilometers from Orenburg to the Soviet-Czechoslovak border near the town of Uzhgorod.

On Czechoslovak territory, the Orenburg gas pipeline is to be linked with the existing 1,030-kilometer transit gas pipeline which has been carrying Soviet natural gas to Austria, West Germany, East Germany, Czechoslovakia since 1973, and also to Italy through Austria since 1974. Work on the 560-kilometer Czechoslovak section of Orenburg pipeline between the town of Alexandrov-Gay (U.S.S.R.) and Sokhranovka (U.S.S.R.) was started in July 1975 and is to be completed in the third quarter of 1978. The Czechoslovak section involves the installation of five compressor stations in addition to pipeline construction. Czechoslovakia's natural gas comes from the north part of the Vienna Basin, the Ostrau area, and Eastern Slovakia. Orenburg gas will be used mainly as an industrial feedstock rather than as a fuel.

In 1975 negotiations were continuing for imports of 3,600 million cubic meters of

[33] United Nations. Economic and Social Council. Coal/WP.1/R.25, Oct. 7, 1975, p. 12.

[34] United Nations. Monthly Bulletin of Statistics. V. 30, No. 9, September 1976.

[35] Czechoslovak Foreign Trade, No. 3, 1976, p. 15.

Soviet gas per year which will be replaced by additional Iranian exports to the U.S.S.R.

Petroleum.—Production of crude oil in Czechoslovakia is insignificant. In 1975 output of crude oil amounted to 142,000 tons. Czechoslovakia's oil comes from Gbely, Hodonin, and Stefanov Fields in the Vienna Basin. Petroleum consumption in 1975 was approximately 18.5 million tons. Some 90% of Czechoslovakia's petroleum supplies came from the Soviet Union. About 15.5 million tons of crude oil were imported from the U.S.S.R. in 1975,[36] an increase of 8.5% compared with that of 1974; about 0.2 million tons came from Iraq and 0.1 from other countries. According to Czechoslovak sources, imports of about 22.4 million tons of crude oil are planned from the U.S.S.R. in 1980, but the Soviet Union will not deliver all of the 16 million tons of crude oil in 1976 for which Czechoslovakia has contracted.

Czechoslovakia participated in financing an oil pipeline from an Adriatic seaport in Yugoslavia to Czechoslovakia. Completion of this line is planned for 1978 and Czechoslovakia is to receive 5 million tons per year of crude oil from Africa and the Middle East.

In 1975, Czechoslovakia produced approximately 17 million tons of refined petroleum products. The total capacity of all eight refineries, including the new 3-million-ton-per-year plant at Kralupy on Vlatava, was reported to be approximately 20 million tons.

Exploration for oil and gas deposits is to be carried out in the lowlands of East Slovakia, the Vienna Basin, and the westernmost parts of the Carpathians. Approximately 900 million korunas are to be invested for geological prospecting to confirm the existance of more oil and gas in these areas. In 1975 prospecting for oil was concentrated near Gottwaldow and Tissany.[37]

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[36] Czechoslovak Foreign Trade, No. 4, 1976, p. 44.

[37] Page 39 of work cited in footnote 36.

The Mineral Industry of Denmark and Greenland

By Joseph B. Huvos [1]

In 1975, Denmark and Greenland remained only minor producers of mineral commodities and had to import almost all necessary fuels and minerals. Domestic mineral production in Denmark included modest amounts of crude oil, iron ore, diatomaceous earth, salt, and construction materials including clays. Greenland produced only lead-zinc ore and cryolite.

The gross national product (GNP) of Denmark and Greenland, which is not reported separately, was approximately $33 billion in 1975.[2] The mineral industry's share in the GNP was only about 1%. Contribution of the principal sectors of the mineral industry to the GNP in 1974 and 1975, and average employment in 1975 are shown in table 1.

Table 1.—Denmark and Greenland: Contribution to the gross national product in 1974 and 1975 and employment in 1975 in the mineral industry

	Average 1975 employment (thousand persons)	Contribution to gross national product		
		Million dollars		Percent change
		1974 [1]	1975 [2]	
Base-metal industry	6.9	189	147	−22
Nonmetallic minerals	16.8	360	389	+8
Chemical industry	19.6	1,200	1,176	−2
Total	43.3	1,749	1,712	−2

[1] Values have been converted from Danish kroner to U.S. dollars at the rate of DKr6.1775=US $1.00.
[2] Values have been converted from Danish kroner to U.S. dollars at the rate of DKr5.7462=US $1.00.

Source: Denmarks Statistisk (Copenhagen). Economic Trends, No. 1, April 1976, pp. 23, 27.

There were a number of significant developments in the mineral industry of Denmark and Greenland in 1975. In the North Sea, oil was found in discovery well No. 2. Exploration for petroleum continued in the North Sea and on the Danish mainland. Det Danske Staalvalsevaerk A/S continued its development into an all-electric steelmaker. In Jutland, Superfos A/S (SAS) continued construction on its new nitric acid, ammonium nitrate, and nitrogen-phosphorus-potassium (NPK) facilities.

[1] Physical scientist, International Data and Analysis.
[2] U.S. Embassy, Copenhagen, Denmark. State Department Airgram A-126, Dec. 31, 1976.
Where necessary, values in Danish kroner (DKr) were converted to U.S. dollars at the rate of DKr5.7462=US$1.00 for 1975 and DKr6.1775=US$1.00 for 1974.

DENMARK

PRODUCTION

In 1975, production of mineral products in Denmark followed a mixed pattern. While mineral production as a whole declined, combined output of nonmetallic minerals gained slightly. Production of selected mineral commodities in 1973, 1974, and 1975 is detailed in table 2.

Table 2.—Denmark: Production of selected mineral commodities

Commodity and unit of measure	1973	1974	1975 p
Cement, hydraulic ---- thousand metric tons --	2,888	2,492	2,237
Chalk [1] ---- metric tons --	81,464	76,358	82,920
Clays, kaolin, crude and washed e ---- do ----	18,000	r 23,000	23,000
Coke, gashouse ---- thousand metric tons --	83	72	e 72
Diatomaceous materials:			
Diatomite e ---- do ----	20	20	25
Moler e ---- do ----	220	220	250
Fertilizer materials, manufactured: [1]			
Nitrogenous, gross weight ---- do ----	79	68	47
Phosphatic, gross weight ---- do ----	642	641	417
Mixed and unspecified, gross weight ---- do ----	297	244	215
Iron and steel:			
Iron ore (less than 42% iron), gross weight ---- do ----	r 6	6	e 13
Pig iron and blast furnace ferroalloys ---- do ----	76	--	--
Crude steel [2] ---- do ----	r 453	535	559
Steel semimanufactures ---- do ----	r 401	478	437
Lead metal, secondary (including alloys) [1] ---- do ----	9	15	13
Lime (quicklime and agricultural) [1] ---- do ----	217	171	166
Peat:			
Fuel e ---- do ----	5	5	--
Agricultural and other [1] ---- do ----	39	32	35
Petroleum:			
Crude ---- thousand 42-gallon barrels --	1,460	689	1,327
Refinery products:			
Gasoline ---- do ----	14,800	13,599	12,809
Jet fuel ---- do ----	107	119	28
Kerosine ---- do ----	994	663	722
Distillate fuel oil ---- do ----	28,519	24,287	23,964
Residual fuel oil ---- do ----	24,179	20,412	16,515
Lubricants ---- do ----	--	32	30
Unspecified ---- do ----	4,899	3,757	3,443
Refinery fuel and losses ---- do ----	3,738	3,206	2,933
Total ---- do ----	77,236	66,075	60,444
Salt [1] ---- thousand metric tons --	368	423	244
Stone, sand and gravel: [1]			
Dimension stone [3] ---- thousand cubic meters --	38	NA	34
Crushed and broken: [4]			
Limestone:			
Agricultural ---- thousand metric tons --	1,983	1,539	2,028
Other ---- do ----	348	339	267
Other ---- thousand cubic meters --	11	11	10
Sand:			
Industrial ---- do ----	2,013	1,197	1,461
Other ---- do ----		410	666

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

[1] Sales.

[2] Excludes shipyard production of crude castings.

[3] Includes only granite and gneiss; quantity of other dimension stone is not reported, but sales value was $454,252 in 1973; $259,413 in 1974; and $209,878 in 1975.

[4] Partial figure; excludes quartz, quartzite and flint, for which the quantities produced are not available. However, sales values were $2,780,560 in 1973; $3,008,909 in 1974; and $2,806,898 in 1975.

TRADE

In 1975, there was no important change in the trade pattern of Denmark. Imports of fossil fuels dominated the picture, amounting to one-tenth of all imports, while exports of mineral products were insignificant. Most mineral trade was with the countries of Europe. Trade in 1973 and 1974 is shown in tables 3 and 4; the minor trade of Greenland is not reported separately.

Table 3.—Denmark: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite and concentrate	6,369	5,189	France 2,539.
Oxide and hydroxide [1]	68	75	West Germany 18; United Kingdom 13; United States 11.
Metal including alloys:			
Unwrought including scrap	6,563	8,993	West Germany 4,074; Sweden 1,585; Belgium-Luxembourg 1,417.
Semimanufactures	9,151	11,391	Sweden 5,278; United Kingdom 1,745.
Antimony metal including alloys, all forms	59	18	Sweden 12.
Chromium, chromite	2	--	
Cobalt metal including alloys, all forms	7	12	West Germany 11.
Copper metal including alloys:			
Scrap	9,249	11,459	West Germany 10,353.
Unwrought	1,637	1,655	West Germany 387; Finland 375; Sweden 368.
Semimanufactures	3,793	5,386	United Kingdom 3,199; Sweden 1,324.
Iron and steel:			
Ore and concentrate	6,154	6,033	West Germany 2,937; United Kingdom 1,515; Netherlands 1,275.
Roasted pyrite	70,729	22,995	NA.
Metal:			
Scrap	112,388	129,642	Sweden 50,608; Spain 40,406; West Germany 17,069.
Pig iron including cast iron	226	332	West Germany 257; Sweden 60.
Sponge iron, powder and shot	249	303	West Germany 298.
Ferroalloys	4	13	All to West Germany.
Steel, primary forms	18,573	14,369	Belgium-Luxembourg 4,228.
Semimanufactures:			
Bars, rods, angles, shapes, sections	65,950	93,067	West Germany 34,610; Sweden 30,301; Norway 11,980.
Universals, plates, sheets	143,774	137,819	Sweden 64,906; West Germany 32,430; Norway 30,841.
Hoop and strip	5,219	15,587	Sweden 13,667.
Rails and accessories	9,318	12,757	Italy 5,033; Spain 2,061; West Germany 2,022.
Wire	4,325	8,688	Sweden 3,841; United States 1,376; Finland 1,088.
Tubes, pipes, fittings	25,152	32,261	Sweden 17,768.
Castings and forgings, rough	7,585	12,876	Sweden 6,961; West Germany 3,870.
Total semimanufactures	261,323	313,055	
Lead:			
Ore and concentrate	593	485	All to West Germany.
Oxides	16	57	Kuwait 25; Saudi Arabia 12.
Metal including alloys:			
Scrap	2,169	621	West Germany 457; Sweden 128.
Unwrought	5,223	7,986	Sweden 2,339; Norway 1,358.
Semimanufactures	140	249	Finland 122.
Magnesium metal including alloys, all forms	60	119	United States 81; Norway 13.
Manganese oxides	3	103	Sweden 77; West Germany 25.
Mercury 76-pound flasks	35	90	United Kingdom 44; Finland 41.
Molybdenum metal including alloys, all forms	1	2	All to West Germany.
Nickel metal including alloys, all forms	199	156	West Germany 62; United Kingdom 50.
Platinum-group metals and silver:			
Waste and sweepings thousand troy ounces	1,498	1,897	United Kingdom 1,280.
Metals including alloys:			
Platinum group do	(2)	444	Austria 129; Finland 122; United Kingdom 100.
Silver do	158	283	NA.
Tin metal including alloys:			
Unwrought	1,004	1,181	Italy 279; Hungary 223; Norway 141.
Semimanufactures	79	92	Sweden 38.
Titanium dioxide	535	629	Turkey 139; Jordan 101; Indonesia 57.
Zinc:			
Oxide	88	125	West Germany 46; Kuwait 22; Norway 17.
Metal including alloys:			
Scrap including blue powder (dust)	2,645	3,985	West Germany 2,165.

See footnotes at end of table.

Table 3.—Denmark: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Zinc—Continued			
Metal including alloys—Continued			
Unwrought and semimanufactures	168	458	West Germany 156; Norway 72.
Other:			
Ash and residue containing nonferrous metals	3,731	4,235	West Germany 2,918.
Oxides, hydroxides, and peroxides of metals, n.e.s	9	56	United Kingdom 22; Sweden 10; West Germany 9.
Base metals including alloys, all forms, n.e.s	3	--	
NONMETALS			
Abrasives, natural, n.e.s:			
Pumice, emery, natural corundum, etc	8	4	West Germany 3; Kenya 1.
Grinding and polishing wheels and stones	1,191	1,716	Ethiopia 375; Iran 362; Iraq 239.
Asbestos	111	514	United Kingdom 277; Sweden 122; France 60.
Barite and witherite	37	167	Norway 150.
Boron materials:			
Crude natural borates	3	--	
Oxide and acid	8	38	Mainly to Sweden.
Cement	r 141,462	179,372	Iceland 40,170; Israel 29,262; Dominican Republic 26,661.
Chalk	16,933	12,187	Sweden 7,205; Norway 3,001; Finland 1,304.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	4,825	3,838	Sweden 862; West Germany 491; Iran 464.
Products:			
Refractory [3]	42,615	48,934	United Kingdom 15,764; West Germany 5,960.
Nonrefractory	72,442	58,905	West Germany 36,710; Norway 9,571.
Cryolite and chiolite	31,070	34,805	NA.
Diamond:			
Gem, not set or strung value, thousands	r $27	$195	Belgium-Luxembourg $86; Sweden $58; Switzerland $27.
Industrial do	--	(2)	NA.
Diatomite and other infusorial earth	62,916	58,889	West Germany 42,635.
Feldspar and fluorspar	20	21	Mainly to Australia.
Fertilizer materials:			
Crude:			
Phosphatic	1	2	NA.
Other	281	339	Sweden 155; Norway 118.
Manufactured:			
Nitrogenous	88	2,330	East Germany 1,265; Norway 520; West Germany 454.
Phosphatic	3,742	74,014	Mainly to East Germany.
Potassic	14	100	All to Greenland.
Other including mixed	257	1,276	East Germany 500; United Kingdom 321; Faroe Islands 262.
Ammonia	5,133	7,603	Sweden 3,617; Finland 3,000.
Graphite, natural	(2)	(2)	Mainly to United Kingdom.
Gypsum and plasters	1,232	1,527	Iceland 1,055.
Lime	27,666	20,323	Norway 12,537; Sweden 4,120.
Magnesite	32	118	Mainly to Yugoslavia.
Mica, all forms	41	120	Sweden 65; Finland 20.
Pigments, mineral including processed iron oxide	399	574	Yugoslavia 122; Finland 90.
Precious and semiprecious stones, except diamond kilograms	169	104	Sweden 20; France 19; West Germany 17.
Salt	167,035	124,536	Sweden 100,506; Norway 19,504.
Sodium and potassium compounds, n.e.s	50	376	United Kingdom 186; Faroe Islands 113.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	40,825	50,476	West Germany 50,172.
Worked	1,424	3,065	West Germany 2,605.
Dolomite, chiefly refractory grade	205	81	Iceland 60.
Gravel and crushed rock thousand tons	2,625	2,231	West Germany 2,188.

See footnotes at end of table.

Table 3.—Denmark: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Stone, sand and gravel—Continued			
Limestone (except dimension)	84,767	95,572	Sweden 56,178; West Germany 26,679; Norway 11,478.
Quartz and quartzite	148	178	Greenland 80; Sweden 42.
Sand, excluding metal bearing	175,055	185,457	Sweden 144,668.
Sulfuric acid	22	1,625	Netherlands 1,578.
Talc, steatite, soapstone, pyrophyllite	74	140	Norway 45; Lebanon 30; Yugoslavia 30.
Other nonmetals, n.e.s.:			
Crude	1,856	1,498	West Germany 787; Sweden 335.
Slag, dross, and similar waste not metal bearing	49,584	41,856	West Germany 24,193; Netherlands 10,967.
Oxides and hydroxides of magnesium, strontium, barium	11	10	Belgium-Luxembourg 9.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	181	17	Equador 6; Yugoslavia 6; Sweden 3.
Carbon black and gas carbon	r 150	78	Cameroon 22; Sweden 18; Finland 13.
Coal and coke including briquets	r 58,914	63,071	Sweden 36,639; Netherlands 12,017.
Gas hydrocarbon, liquefied	10,178	5,050	Sweden 2,774; United Kingdom 1,026.
Peat including peat briquets and litter	1,878	3,123	Norway 1,661.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	6,107	5,808	Sweden 4,792.
Kerosine and jet fuel do	359	355	Sweden 218; Norway 91.
Distillate fuel oil do	6,357	8,094	Sweden 5,857.
Residual fuel oil do	7,245	3,723	Sweden 2,692; Norway 539.
Lubricants do	137	166	Norway 103; Sweden 19.
Mineral jelly and wax do	5	6	Sweden 2.
Other do	891	1,419	Sweden 760; West Germany 259; Norway 235.
Total do	21,101	19,571	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	10,646	6,570	Sweden 4,500; United Kingdom 691.

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 4.—Denmark: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	1,777	3,107	All from Guyana.
Oxide and hydroxide [1]	769	926	West Germany 514; United Kingdom 107.
Scrap	1,014	1,117	Norway 890; Sweden 155.
Unwrought	6,038	6,800	Norway 3,715.
Semimanufactures	51,896	53,897	Norway 10,031; West Germany 9,556; Belgium-Luxembourg 8,027.
Antimony metal including alloys, all forms	23	43	People's Republic of China 27; United Kingdom 8.
Cadmium metal including alloys, all forms	6	6	Norway 3; East Germany 2; Belgium-Luxembourg 1.
Chromium:			
Chromite	1,279	1,456	Republic of South Africa 1,125; Finland 235.
Oxide and hydroxide	358	439	West Germany 401.
Cobalt:			
Oxide and hydroxide	4	10	Belgium-Luxembourg 9; Canada 1.
Metal including alloys, all forms	23	30	Belgium-Luxembourg 22; East Germany 4; United Kingdom 3.
Copper metal including alloys:			
Scrap	220	711	West Germany 328; United Kingdom 198.
Unwrought	6,073	5,493	Belgium-Luxembourg 4,049; Sweden 785.

See footnote at end of table.

Table 4.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless other specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Copper metal including alloys—Continued			
Semimanufactures	34,398	31,001	Sweden 9,647; West Germany 5,658; United Kingdom 5,638.
Iron and steel:			
Ore and concentrate	1,602	6,349	West Germany 2,937; United Kingdom 1,515; Netherlands 1,275.
Roasted pyrite	35,692	28,960	Norway 22,040.
Metal:			
Scrap	4,228	4,347	Sweden 2,341.
Pig iron including cast iron [2]	78,822	71,499	U.S.S.R. 31,380; West Germany 16,947.
Ferroalloys	16,917	14,268	Norway 11,584.
Steel, primary forms	82,689	76,505	Norway 38,277; Sweden 24,946; West Germany 9,023.
Semimanufactures:			
Bars, rods, angles, shapes, sections [3]	485,489	490,950	West Germany 152,136; France 88,664; Sweden 66,366.
Universal, plates, sheets	772,102	770,456	West Germany 259,754; Sweden 117,638; Belgium-Luxembourg 86,543.
Hoop and strip	83,047	73,825	West Germany 30,890; Sweden 11,985; Belgium-Luxembourg 11,721.
Rails and accessories	15,514	11,550	France 5,075; West Germany 2,537; Belgium-Luxembourg 1,682.
Wire	24,370	23,817	West Germany 10,245; Belgium-Luxembourg 7,072; Sweden 3,756.
Tubes, pipes, fittings	212,879	201,053	West Germany 81,769.
Castings and forgings, rough	1,139	1,393	West Germany 396; Norway 195.
Total semimanufactures	1,594,540	1,573,044	
Lead:			
Oxides	947	841	West Germany 207; East Germany 155; Sweden 108.
Metal including alloys:			
Scrap	6,840	5,613	Norway 2,508; West Germany 801.
Unwrought	9,507	11,470	Sweden 4,560; United Kingdom 2,468; Canada 1,244.
Semimanufactures	1,313	1,032	West Germany 887.
Magnesium metal including alloys, all forms	154	121	Norway 95; West Germany 20.
Manganese:			
Ore and concentrate	3,385	2,891	People's Republic of China 1,106; Gabon 570.
Oxides	2,790	2,254	Belgium-Luxembourg 898.
Mercury ---------- 76-pound flasks	424	658	U.S.S.R. 345; Turkey 133.
Molybdenum metal including alloys, all forms	3	17	Belgium-Luxembourg 12.
Nickel:			
Matte	56	8	All from United Kingdom.
Metal including alloys:			
Unwrought, including scrap	60	191	United Kingdom 140.
Semimanufactures	656	427	West Germany 135; United Kingdom 108.
Platinum-group metals and silver including alloys, all forms:			
Platinum group thousand troy ounces	15	15	Switzerland 4.
Silver ---------- do	3,434	2,447	United Kingdom 575; West Germany 450.
Tin:			
Oxide	5	20	West Germany 18.
Metal including alloys:			
Scrap	290	216	Switzerland 62; Singapore 24; Norway 22.
Unwrought	570	756	Malaysia 244; Netherlands 104; United Kingdom 77.
Semimanufactures	124	84	United Kingdom 51; West Germany 25.
Titanium oxides	7,946	7,745	Norway 2,433; West Germany 1,575; United Kingdom 1,488.
Tungsten metal including alloys, all forms	15	11	West Germany 7; Sweden 2.
Zinc:			
Oxide	2,654	1,547	West Germany 548; Norway 207; United Kingdom 198.
Metal including alloys:			
Blue powder including scrap	866	4,814	West Germany 2,203; Norway 664; Belgium-Luxembourg 589.

See footnotes at end of table.

Table 4.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Zinc—Continued			
Metal including alloys—Continued			
Unwrought	14,857	15,083	Norway 3,720; Finland 2,543; United Kingdom 2,200.
Semimanufactures	6,000	4,525	France 1,859; Poland 699; West Germany 592.
Other:			
Ore and concentrate of base metals n.e.s	538	235	Finland 201.
Ash and residue containing nonferrous metals	6,629	3,822	West Germany 1,671.
Metals including alloys, all forms:			
Metalloids	3,020	495	Norway 281; Sweden 108.
Alkali, alkaline earth and rare-earth metals	161	182	West Germany 141; France 40.
Pyrophoric alloys	5	6	United Kingdom 4; West Germany 1.
Base metals including alloys, all forms, n.e.s	770	126	Sweden 33; Belgium-Luxembourg 26.
NONMETALS			
Abrasives, natural, n.e.s:			
Pumice, emery, natural corundum, etc	7,865	10,715	West Germany 7,387; Greece 1,505.
Dust and powder of precious and semiprecious stones kilograms	8	9	United States 4; Switzerland 3.
Grinding and polishing wheels and stones	1,258	1,216	West Germany 372; Sweden 293; Austria 281.
Asbestos	33,505	28,181	Canada 13,591; Cyprus 8,575.
Barite and witherite	3,129	5,250	Ireland 4,378.
Boron materials:			
Crude natural borates	3,174	3,496	United States 2,774; Turkey 601.
Oxide and acid	216	311	Turkey 95; United States 82; France 59.
Cement	241,669	4,408	West Germany 1,440; United Kingdom 1,381.
Chalk	3,406	3,076	Sweden 2,262; France 617.
Clays and clay products (including refractory brick):			
Crude clays, kaolin and other clays	63,132	58,747	United Kingdom 39,062; Czechoslovakia 7,014.
Products:			
Refractory (including nonclay bricks)	33,211	37,737	West Germany 14,323; United Kingdom 7,517; Austria 6,706.
Nonrefractory	168,645	62,692	West Germany 27,507; Italy 7,707; Sweden 6,707.
Diamond:			
Gem, not set or strung thousand carats	8	6	Belgium-Luxembourg 2; United Kingdom 1.
Industrial do	r 71	784	West Germany 370; Japan 350.
Diatomite and other infusorial earth	4,116	4,023	United States 1,746.
Feldspar, leucite and nepheline syenite	8,229	10,145	Norway 9,041.
Fertilizer materials:			
Crude:			
Nitrogenous	5,319	9,420	All from Chile.
Phosphatic	344,959	350,879	Morocco 238,601; U.S.S.R. 102,675.
Potassic	1,325	225	All from West Germany.
Manufactured:			
Nitrogenous	r 236,138	109,096	West Germany 28,175; Norway 25,517.
Phosphatic:			
Thomas (basic) slag	320	100	All from West Germany.
Other	8,344	(1)	NA.
Potassic	247,703	247,286	West Germany 156,149; East Germany 62,289.
Other including mixed	608,266	700,181	Norway 540,188.
Ammonia	249,227	217,878	Netherlands 37,990; Aruba 25,881; East Germany 23,853.
Fluorspar	2,070	2,368	United Kingdom 1,146; France 965; West Germany 256.
Graphite, natural	221	364	West Germany 138; United Kingdom 126.
Gypsum and plaster	304,000	409,375	Poland 141,832; Spain 62,988.
Lime	3,444	2,834	West Germany 1,618.

See footnotes at end of table.

Table 4.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Magnesite	6,110	11,371	Czechoslovakia 4,472; Austria 3,033.
Mica:			
Crude including splittings and waste	375	264	United Kingdom 116; Norway 71.
Worked including agglomerated splittings	117	66	France 25; West Germany 17.
Pigments, mineral:			
Natural crude	442	359	Cyprus 166; West Germany 78; Austria 64.
Iron oxides, processed	5,517	5,940	West Germany 4,099.
Precious and semiprecious stones, except diamond kilograms	r 6,846	3,465	West Germany 1,460; Brazil 1,396.
Pyrite	109,056	21,351	Spain 21,294.
Salt	175,249	265,364	West Germany 127,514; U.S.S.R. 82,212.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous (including marble)	9,000	3,940	Sweden 2,025; Italy 1,162.
Slate	15,625	12,255	Norway 6,902; West Germany 2,258.
Other (granite, gneiss, etc.)	65,958	37,758	Mainly from Sweden.
Worked, all types	53,088	54,813	West Germany 17,084; Portugal 15,233; Sweden 14,336.
Dolomite chiefly refractory grade	31,347	28,826	Norway 25,340.
Gravel and crushed rock	521,808	530,296	Sweden 463,642.
Limestone (except dimension)	135,008	167,906	Sweden 121,321.
Quartz and quartzite	5,810	6,063	Sweden 3,131; Norway 1,534.
Sand, excluding metal bearing	122,889	154,463	Belgium-Luxembourg 9,857.
Sulfur:			
Elemental, all forms	15,995	78,113	West Germany 75,508.
Sulfur dioxide and sulfuric acid	38,760	18,242	West Germany 7,702; Norway 5,342.
Talc, steatite, soapstone, pyrophyllite	11,249	13,195	Norway 8,021; West Germany 3,447.
Other nonmetals, n.e.s.:			
Crude	55,087	49,533	West Germany 41,061.
Slag, dross and similar waste, not metal bearing	2,232	4,675	Finland 1,920; United Kingdom 1,643.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	924	4,621	Belgium-Luxembourg 3,405; United States 509.
Carbon black	3,873	3,675	United Kingdom 1,312; Sweden 811; United States 375.
Coal and coke including briquets thousand tons	3,183	3,816	Poland 3,064; U.S.S.R. 392.
Gas, hydrocarbon, liquefied do	116	105	West Germany 34; Netherlands 20; United Kingdom 18.
Peat including peat briquets and litter	17,229	19,686	Norway 10,807; U.S.S.R. 5,705.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	71,846	68,988	Iran 32,667; Saudi Arabia 7,893.
Refinery products:			
Gasoline do	9,960	8,917	Netherlands 2,388; Belgium-Luxembourg 1,346.
Kerosine and jet fuel do	5,456	4,819	United Kingdom 1,935; Netherlands 1,507.
Distillate fuel oil do	32,354	29,467	United Kingdom 12,241; Netherlands 5,739; U.S.S.R. 4,420.
Residual fuel oil do	33,078	30,902	Netherlands 8,618; United Kingdom 6,037.
Lubricants do	715	819	United Kingdom 302; Netherlands 206; Sweden 96.
Mineral jelly and wax do	149	141	West Germany 78; People's Republic of China 19.
Other do	1,416	1,675	Netherlands 752; West Germany 518.
Total	83,128	76,740	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	25,772	20,119	West Germany 4,351; United Kingdom 4,296; Norway 3,133.

r Revised. NA Not available.

[1] Not including synthetic corundum.

[2] Including spiegeleisen, grit, sponge, and powder and shot of iron and steel.

[3] Including wire rod.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Production of iron and steel continued to be based mainly on scrap, supplemented by small quantities of iron ore and roasted pyrite. DDS, with plants located at Frederiksvaerk in Sjaelland, north of Copenhagen, remained the country's main iron and steel producer, accounting for most crude steel produced and almost all rolled product output. The principal products of DDS were sections and heavy plates.

In 1975, despite reduced output due to world recession, DDS continued its expansion into an all-electric steelmaking operation. According to plans, steelmaking capacity was to be raised to 500,000 tons per year in 1976 and perhaps double that figure at some later date.

Nonmetals.—*Cement.*—In 1975, the Danish cement industry remained depressed owing to the low level of building activity in the country. Cement plant utilization was only two-thirds of full capacity. A/S Aalborg Portland-Cement-Fabrik continued to control the country's five cement plants; one each is located near Mariager, Karlslunde, and Nørresundby, and two are near Alborg.

Fertilizer Materials.—In 1975, Denmark remained a net importer of fertilizer materials. Imports included phosphate rock, mainly from North Africa and the U.S.S.R.; nitrogenous materials from Norway, the United States, and West Germany; and potassic materials imported principally from West Germany. SAS, Denmark's largest fertilizer manufacturer, accounted for most of the phosphoric, nitric, sulfuric acid, phosphorus (P), phosphorus-potassium (PK), and NPK fertilizers produced in 1975. The plants are located at Fredericia and Nørresundby, Jutland.

Construction continued on SAS's third nitric acid plant at Fredericia, in Jutland; the plant is to use imported ammonia as a raw material. Construction continued also on SAS's additional ammonium nitrate and NPK prilling facilities at the same site which are slated to raise SAS's NPK capacity from 250,000 to 600,000 tons per year in 1976.[3]

Salt.—Dansk Salt Co. continued producing rock salt by solution mining of a salt dome at Hvornum in northeast Jutland.

Stone, Sand and Gravel.—Operations in the stone, sand, and gravel business included Ahsell & Agren's industrial sand production on Bornholm Island; A/S Faxe Kalkbrud's industrial limestone; and Dansk-Landbrugs Grovvaresselskab a.m.b.a. agricultural limestone quarry. Moler, a clay containing diatomaceous earth found only in Denmark, was mined on the islands of Fur and Mors in northwest Jutland.

Mineral Fuels.—In 1975, Denmark had to rely almost completely on imports of fuels, mainly crude oil and petroleum products, while only modest quantities of crude oil and hydropower were produced domestically. There were several plans under consideration for securing the country's energy supply, and making it less susceptible to the influence of market conditions similar to those of the 1973–74 oil crisis. According to one of these plans, a 1,000-megawatt nuclear powerplant was to be built in the country, supplied eventually by fuel derived from uranium resources under exploration in Greenland. Another plan under consideration was to import natural gas from European producers.

Table 5 shows supply and apparent consumption of energy in Denmark for 1974 and 1975, including minor amounts for Greenland.

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[3] Superfos A/S. 1974 Annual Report. 1975, p. 3.

Table 5.—Denmark and Greenland: Supply and apparent consumption of energy-producing materials in 1974 and 1975
(Million tons of standard coal equivalent)[1]

	Total energy	Coal and coke	Petroleum and refinery products[2]	Hydroelectric power[3]
1974:				
Production[4]	0.1	--	0.1	(5)
Imports	34.9	3.7	31.1	0.1
Exports	4.4	.1	4.2	.1
Apparent consumption	30.6	3.6	27.0	--
1975:p				
Production[4]	.2	--	.2	(5)
Imports	33.5	4.3	29.0	.2
Exports	4.0	--	3.9	.1
Apparent consumption	29.7	4.3	25.3	.1

p Preliminary.
[1] 1 ton of standard coal equivalent (SCE) =7,000,000 kilocalories.
[2] Includes some liquid natural gas imports.
[3] Includes foreign trade of all electricity.
[4] Includes only primary energy.
[5] Less than ½ of 0.1.

Source: Danmarks Statistik (København). Monthly Bulletin of Foreign Trade, December 1975. Danmarks Statistik (København). External Trade of Denmark 1974. U.S. Embassy, Copenhagen, Denmark. State Department Airgram A-123, Dec. 24, 1975, and Telegram No. 7869, Mar. 10, 1976.

Petroleum.—Exploration and Development.—Oil was reported in the North Sea at discovery well No. 2, 25 kilometers northwest of the Dan oilfield.[4] Crude oil production in the Danish sector of the North Sea was about 166,200 tons in 1975 and was to reach 1.2 million tons in 1978, which corresponds to only one-twentieth of present annual demand. The sole concessionaire in the Danish sector of the North Sea remained the Dansk Undergrunds Consortium (DUC) composed of Royal Dutch/Shell Group (40%), AP Møeller (30%), Standard Oil Co. of California (15%), and Texaco, Inc. (15%).

DUC also started drilling in northwest Jutland, at the 1 Oddesund well, with a target depth of 2,700 meters. Drilling of another well was to be started toward the end of 1975 at 1 Hyllebjerg, about 5 kilometers north of Farsø.

During 1975, the Danish Government started negotiations for gaining partial control of DUC.

Refining.—Oil refining capacity of the country's three refineries remained at about 11.5 million tons in 1975.[5] A/S Dansk Shell operated a 3.2-million-ton-per-year refinery at Fredericia, eastern Jutland; Dansk Esso A/S operated a 3.6-million-ton-per-year refinery at Kalundborg, western Sjaelland; and Gulf Oil Refining A/S operated a 4.7-million-ton-per-year refinery at Stignaes, southeastern Sjaelland.

GREENLAND

In 1975 Greenland produced only lead-zinc ore; trade is included with that of Denmark, and is not separately reported.

In 1975 Greenex reported finding a massive high-grade copper ore occurrence on Agpat Island near Umanak, near the west coast of Greenland. There were plans to drill this copper occurrence in 1976. Exploration for petroleum was to be started on the Continental Shelf.

The 1975 world recession had little influence on the modest lead and zinc output at Greenex Black Angel mine near Marmorilik in western Greenland. Vestron Mines Ltd. owns 62% of Greenex; in turn, Cominco Ltd. of Canada owns 62% of Vestgron. Concentrates for processing were shipped to Europe during the shipping season from early June until December in ships strengthened against the ice, and some concentrate was sent to the United States. Greenland had no lead and zinc smelting facilities in 1975. Planned development and exploration at the Black Angel mine continued in 1975.

Kryolitselskabet Øresund A/S (KØAS),

[4] The Petroleum Economist. July 1975, p. 257.
[5] Petroleum Times. Jan. 23, 1976, p. 42.

Copenhagen, invited Sweden's State-owned mining company, Luossavaara-Kirunavaara AB (LKAB), Stockholm, to participate in an underground iron ore mining project in Greenland. The project might involve an investment of up to $700 million according to LKAB. KØAS was conducting exploration to delineate the iron ore body about 75 miles north of the town of Godthab, and is interested in bringing LKAB into the project because of its extensive knowledge of underground iron ore mining.

Cryolite shipping by KØAS continued from accumulated stocks in southeast Greenland at Ivigtut. The crude ore was shipped to Copenhagen for beneficiation at the plant at KØAS.

Original plans called for doubling Greenland's proven uranium ore reserves at Kvanefjeld near Narssaq and conducting pilot plant beneficiation tests for uranium ore. The Danish Parliament has repeatedly delayed the decision to start this project, partly because of the continued study of the project's environmental effects.

Off southwest Greenland, exploration for oil was to start early in 1976 on a concession of 13 blocks with a combined area of about 5,400 square miles. The first well in the area was to be drilled by a Canadian-French-Danish consortium, TGA-Grepco, one of the six groups awarded concessions in the area in 1975. Total Grønland Olie SA, the operator for the group planned to use a dynamically positioned drilling ship, the only technique possible in these Arctic waters.

Greenland's production of mineral commodities for 1973, 1974, and 1975 is detailed in table 6.

Table 6.—Greenland: Production of mineral commodities
(Metric tons)

Commodity [1]	1973	1974	1975 p
Lead, mine output, metal content	5,700	24,100	24,300
Zinc, mine output, metal content	27,200	88,500	84,700

p Preliminary.
[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 information is inadequate to make reliable estimates of output levels.

The Mineral Industry of Egypt

By Janice L. Jolly [1]

During 1975, several important events boosted Egypt's mineral industry and general economy. The return from Israeli control of important oilfields in the Sinai Peninsula in October and the reopening of the Suez Canal in June were both expected to contribute materially to hard currency earnings in 1976 and beyond. With projected production from oil discoveries made in 1975 and the recovered facilities, Egypt was expected to become a significant oil exporter by 1980. It was hoped that Suez Canal traffic would soon return to preclosure levels, and 1976 revenues were expected to total as much as $500 million,[2] again becoming a foreign exchange earning asset. The "open door" policy decision of 1974 marked a profound change in attitudes and expectations and reversed the trend toward increasing economic stagnation that had resulted from a decade or more of centralized direction. Even so, substantial foreign investment was not expected to occur before investment laws were further liberalized. Reforms in exchange rate structure and other fiscal policy areas were especially needed and were being considered by the Government. Among other fiscal problems in 1975, inflation was estimated at an annual rate of 25%. The balance of payments deficit for 1975 was about $3.2 billion, and total foreign indebtedness was reported to be in excess of $14.1 billion.[3] A 5-year plan, to begin in 1976, was being formulated to rectify the balance of payments and to decrease the existing deficit.

The 1975 gross national product (GNP) was estimated at $9,618 million, which at constant (1973) prices reached a 9.2% growth rate over that of 1974.[4] Part of the upward pace was attributable to increased production in both the iron and steel and aluminum industries. The mining industry reportedly achieved a 25% increase in 1975 production value over that of 1974. Investments for the 1975 development plan amounted to $1,874 million, up 40.8% over those of 1974. The "industry, petroleum and mineral wealth" economic sector was alloted 34.9% of the total investments. About $77 million was allocated to the iron and steel industry to establish two additional blast furnaces. The Naj Hammadi aluminum project was allocated about $26 million. The Talkha fertilizer mill was allocated $7.7 million, aiming for production of 250,000 tons of ammonia nitrate fertilizers per year. A third coke line was allocated about $7.4 million and was expected to start production by late 1976 with an annual capacity of 700,000 tons of coke. The Hamrawayn phosphates project was allocated about $8 million and was operated during 1975 at a capacity of 300,000 tons, with full capacity of 600,000 tons per year expected to be reached in late 1976. The petroleum sector was allocated about $211 million, which included about $33 million for increasing the capacity of the Mustrurud and Tanta refineries by about 5.2 million barrels, the Alexandria petroleum refinery by about 3.5 million barrels, and $17.9 million was allocated for a new Suez refinery in 1975. The electrical sector, which included the Kattara depression project, was allocated about $116.9 million. The first stage of the Kattara project will

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[1] Physical scientist, International Data and Analysis.
[2] Where necessary, values have been converted from Egyptian pounds, (£E) to U.S. dollars at the rate of £E1.00=US$2.66.
[3] MEMO (Cyprus). Middle East Money. V. 3, No. 8, Feb. 23, 1976, p. 5.
[4] Federation of Egyptian Industries, (Cairo, Egypt). 1975 Yearbook, p. 14.

set up a power station with a capacity of 600 megawatts by 1985.

Foreign assistance to Egypt totaled about $2 billion in 1975. Saudi Arabia led with $600 million, followed by Kuwait with $500 million, and the United States with $350 million. The rest came from the United Arab Emirates, Iraq, Iran, West Germany, France, Bulgaria, Romania, Yugoslavia, and the U.S.S.R. Studies were being conducted on a number of planned foreign-capital joint ventures, including: A sponge iron project at Alexandria with initial costs estimated at $200 million and involved Japanese, Brazilian, and West German participation; an iron ore project estimated at $102 million; and a number of petroleum projects estimated at about $2 billion. About 20 petroleum agreements were concluded with foreign companies. Construction of the Suez-Mediterranean (SUMED) pipeline, financed 50% by Arab capital, was started. West Germany was assisting on the $134 million Abu Qir ammonia-urea fertilizer project, which started construction in 1975, and was to undertake studies leading to the development of the Kattara depression electrical scheme. Iran was installing a plant for the manufacture of phosphatic fertilizers, utilizing sulfur from Iran and phosphates from Egypt; establishing a petrochemical and plastics plant (with productive capacity of about 8,000 tons and 50,000 tons per year, respectively); and taking part in an international project for the establishment of the Suez-Port Said pipeline. The U.S.S.R. agreed to expand the annual production capacity of the aluminum complex from 100,000 to 166,000 tons, to establish a new cement factory in Assiut, to expand the National Cement Co., to undertake a new cement project with a capacity of 1 million tons per year, and to assist in the exploitation of the Abu Tartur phosphates. The U.S.S.R. was also to undertake necessary studies for expanding the Helwan iron and steel complex, for establishing a new iron and steel complex at Alexandria with a 3-million-ton-per-year capacity, and for installing a nuclear powerplant. A Yugoslavian loan for $80 million was made to Egypt for the construction of new cement plants in 1975. Romania was to assist with development of the Cairo petrochemicals complex, doubling the production of the Misr sodium carbonates factory, and construction of the Hamrawayan phosphate complex. Bulgaria was to cooperate with ferromanganese, ferrochrome, calcium carbide, and silicon carbide projects. The World Bank made a loan to extend the Torah cement plant and agreed to lend $35 million in 1976 to finance new railways and establish a railway maintenance center following a similar loan for $55 million made in 1975. Between 1974 and 1976, the Kuwait Fund for Arab Economic Development (KFAED) assisted with the Talkha fertilizer plant, the Torah cement plant, and the Cairo water supply. France will assist in the development of coke plants and in improving the electrical capacity at Abu Qir. On December 14, 1975, Compagnie Electromecanique (CEM) signed a contract for raising the Abu Qir capacity to 600,000 kilowatts by adding two groups of turbo-alternators of 150,000 kilowatts each. The financing was to be credits accorded by France. The first stage of the Abu Qir project was financed by the African Development Bank and the KFAED. The United States was assisting in Suez Canal reconstruction, and was considering nuclear plant development. The Alexandria Port Authority secured a $95 million loan for development of the port from the International Bank for Reconstruction and Development (IBRD), Japan, and the United States. The Egyptian Government allocated $614 million for renovation and expansion of Port Said, scheduled to start in February 1976. Port capacity was to increase to 3 million tons by 1979. Tenders were invited for phase 2 of the Suez Canal improvement program, which will allow tankers up to 150,000 deadweight tons to pass through fully loaded at yearend 1978. Egypt was planning to construct 10 nuclear power stations in the next 20 years to cope with increasing industry demands for energy. The first station at Sidi Keir was to have a capacity of 600 to 800 megawatts. Tenders were submitted by Westinghouse Corp. and General Electric Co.

The United Nations Development Program (UNDP) supported a mineral survey of the massive sulfides and nickel-copper mineralization in the ophiolitic belt of the Aswan area in southern Egypt, which was to be completed in mid-1976 at a cost of $1.3 million. The United Nations was assisting in several field missions, including geochemical exploration for zinc, lead, and copper deposits at Um Smiuky and the Khadda Hill areas; and exploration for manganese, lead, and sulfur along the Red Sea coast sites at Akarem and Um Smiuky. A new UNDP project for mineral exploration along the Red Sea coast was under consideration. The Egyptian General Organization for Geological Researches and Mining Projects (GOGRM) started a new field season running throughout 1974 and 1975 with 10 mapping, geological, and general exploration surveys. This included work on the Barramia gold mine, the iron ores at Um Smiuky, copper ore at Khadda Hill, and limestone located west of Alexandria. Three field projects for geologic exploration were done by Soviet technicians and the GOGRM, including exploration of the Safagua area, the Jabal al Sebaei area, the Barramia gold area, and Assel Hill iron ore deposits.

PRODUCTION AND TRADE

Mineral commodity production, excluding petroleum refinery products, in 1975 increased in value to an estimated $1,169 million, compared with an estimated $768 million for 1974. The value of mineral production in 1975 constituted about 12% of the GNP, compared with about 9% in 1974. Petroleum refinery production was valued at $632 million in 1975, with an input of about 57.5 million barrels of crude oil. Output of crude oil increased 57% to 84.3 million barrels in 1975, primarily because of the return of the Sinai oilfields. Other mineral industry production increases included crude steel (32%), cement (8.8%), marine salt (3.0%), iron ore (8.6%), talc (31%), and asbestos (69%). Production decreases for 1975 occurred for gypsum (2%), phosphate rock (20%), and manganese (27%) compared with 1974. Primary aluminum production in 1975 was 5,000 tons; this was the first significant production since the Naj Hammadi plant came into operation in late 1974. Figures on the quantity of minerals produced are shown in table 1.

Oil exports in 1975 were valued at $310 million and went mainly to the U.S.S.R., Bulgaria, East Germany, Yugoslavia, Brazil, Romania, and Turkey. Distillate fuel oil was exported to Sweden, Switzerland, and Italy. Petroleum was imported from Saudi Arabia, Iran, Iraq, the Netherlands, and the U.S.S.R. Refined petroleum was imported from the United Kingdom, United States, Netherlands, West Germany, and Yugoslavia. An estimated 141,600 tons of phosphate rock was exported in 1975, up from the 120,260 tons exported in 1974. North Korea was a significant importer of Egyptian phosphate rock. The United Kingdom imported 2,000 tons, and was the first market economy country to import phosphate rock from Egypt in recent years. Exports of phosphate to China also increased in the first half of 1975. Egyptian exports to East European countries were 67% of total exports and imports from East European countries were 15%. More than 60% of the 1975 imports came from western countries, and Japan. Imports from the United States nearly doubled to $768 million in 1975. The U.S.S.R. remained the biggest trading partner in 1975. Egypt and the U.S.S.R. signed a 1975 trade protocol for $851 million and for 1976, $650 million in two-way trade was scheduled. Egypt was to import coal and petroleum products and the Soviets were to receive petroleum and agricultural products. In 1975, Egypt also signed trade agreements with Iraq, Poland (from which it was to import 250,000 tons of coke plus fertilizers and sulfur), North Korea, the United States, France, Japan, and Kuwait. In a trade agreement signed with India, India was to supply coal, iron products, and other metals, and Egypt was to export crude oil to India.

The latest available trade data were published in the 1974 edition of this chapter.

Table 1.—Egypt: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum	--	--	5,000
Chromite	485	295	[e] 300
Iron and steel:			
Iron ore and concentrate ____thousand tons__	656	1,032	1,121
Pig iron ____do____	[e] 400	496	413
Ferroalloys ____do____	[e] 4	[e] 4	5
Crude steel ____do____	[r] [e] 290	270	348
Semimanufactures ____do____	566	555	NA
Manganese ore and concentrate	2,686	4,947	3,613
NONMETALS			
Asbestos [2]	329	283	479
Barite	1,890	274	662
Cement, hydraulic ____thousand tons__	3,617	3,264	3,579
Clays:			
Fire ____thousand cubic meters__	900	950	([3])
Kaolin	30,305	25,840	NA
Diatomite	1,600	1,600	412
Feldspar, crude	3,033	2,228	--
Fertilizer materials:			
Crude phosphate rock ____thousand tons__	553	507	404
Manufactured:			
Nitrogenous (N content) ____do____	66	101	NA
Phosphatic:			
Thomas slag ____do____	38	35	NA
Superphosphate ____do____	419	464	NA
Fluorspar	1,509	1,121	[e] 1,200
Gypsum and anhydrite, crude ____thousand tons__	524	561	550
Mica	[r] 22	98	NA
Pumice	250	250	NA
Salt, marine ____thousand tons__	454	485	500
Sodium sulfate, natural	2,000	15,710	NA
Stone, sand and gravel:			
Basalt ____thousand cubic meters__	[4] 388	[4] 324	NA
Dolomite ____thousand tons__	90	100	NA
Granite:			
Broken ____do____	20	20	NA
Dimension ____cubic meters__	400	500	NA
Gravel ____thousand cubic meters__	1,600	1,300	NA
Limestone and other calcareous, n.e.s ____do____	5,200	5,300	583
Marble:			
Marble blocks (including alabaster) ____cubic meters__	7,400	8,000	([5])
Broken and gravel	5,300	5,500	NA
Quartz	12,713	9,528	NA
Sand, including glass sand ____thousand cubic meters__	3,065	3,430	NA
Sandstone ____do____	102	110	NA
Stone, n.e.s ____do____	150	120	NA
Sulfur:			
Elemental byproduct	[e] 1,000	2,755	[e] 3,000
Sulfuric acid	19,718	30,933	NA
Talc, soapstone, steatite, pyrophyllite	7,036	3,942	5,171
MINERAL FUELS AND RELATED MATERIALS			
Coke:			
Oven and beehive ____thousand tons__	344	555	[e] 500
Gashouse and other low temperature [e] ____do____	30	30	30
Total [e] ____do____	[r] 374	[r] 585	530
Gas, natural:			
Gross production ____million cubic feet__	30,700	49,700	50,600
Marketed [e] ____do____	3,100	15,000	40,000
Petroleum:			
Crude ____thousand 42-gallon barrels__	[r] 60,483	53,715	84,348
Refinery products:			
Gasoline and Naphtha ____do____	[r] 8,328	10,090	11,314
Kerosine and jet fuel ____do____	[r] 8,831	10,400	10,012
Distillate fuel oil ____do____	[r] 8,941	10,720	11,988
Residual fuel oil ____do____	[r] 20,316	18,988	28,425
Lubricants ____do____	154	210	371
Other:			
Liquefied petroleum gas ____do____	499	708	580
Asphalt ____do____	[r] 869	406	715
Unspecified ____do____	--	98	--
Refinery fuel and losses ____do____	[r] 1,619	1,746	1,805
Total ____do____	49,557	53,366	65,210

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

[1] Egypt produces some sodium carbonate but output is not reported and available information is inadequate to make reliable estimates of output levels.

[2] Includes vermiculite.

[3] Production reported as 253,621 metric tons instead of in cubic meters.

[4] 1973 production includes quantity valued at $316,986 and excludes quantity valued at $72,823; 1974 production includes quantity valued at $310,191 and excludes quantity valued at $48,166.

[5] Production reported as 36,086 square meters instead of in cubic meters.

COMMODITY REVIEW

METALS

Aluminum.—The first phase of the Naj Hammadi aluminum plant came into operation in the fourth quarter of 1974. Plant capacity was expected to reach 100,000 tons per year by late 1976, and to reach full capacity of 170,000 tons per year by 1977. This $140 million project, built with Soviet aid, used imported alumina from Guinea and the U.S.S.R. The plant was owned 100% by Egypt and uses hydropower from the Aswan Dam. About 30% of 1975 production was allocated for export and that went to the U.S.S.R.

Iron and Steel.—The Helwan steel complex was enlarged in 1974 and 1975 with the addition of two blast furnaces, making a total of four increasing the production capacity to 1.5 million tons of steel per year. Production of 1.75 million tons per year is forecast eventually with about 250,000 tons earmarked for export. The plant presently produces 500,000 tons of products. The two new furnaces require less coking coal (700,000 tons of coal to produce 1.5 million tons of steel) than the two older furnaces, which consume coking coal at the rate of 1.3 million tons to produce 1 million tons of steel. The iron and steel complex also uses 1.5 billion kilowatt-hours of electricity, approximately 15% of the Aswan High Dam output. Iron ore reserves at Bahareza Oasis of the Western Desert, where mining began in 1973, were estimated at 195 million tons averaging 54% iron and 3% SiO_2. Iron ore was transported 350 kilometers by rail to the Helwan complex.

The Helwan steel plant was plagued by a number of problems[5] that have kept production at little more than half capacity. It cost more in foreign exchange to keep the plant operating than it gained in export sales. Among problems encountered were: The unusually high salt content of Egyptian iron ore, which corroded the machinery; personnel and management problems; improper use of equipment; and maintenance and supply problems. Efforts were being made to solve these problems through a United Nations Industrial Development Organization 2-year study, costing $835,575, and being carried out by a U.S. steel engineering consultant team.

Lead and Zinc.—The Mines and Quarries Design Bureau was studying a project for exploitation of lead and zinc in the Om Feig area in the Eastern Desert, north of Mersa Allam, where reserves were estimated to be 1.5 million tons of an unspecified grade.

Tin.—On February 5, 1975, the Mines and Quarries Design Bureau announced completion of a study project on extracting tin from the Al 'Algala area in the Eastern Desert, where reserves were estimated at 500,000 tons (unspecified grade).

Titanium.—Some interest was shown in ilmenite ores, estimated at 4 million tons, in the black sands at various points along the Mediterranean coast and at Abu Ghalga, about 30 kilometers from the Red Sea.

Uranium.—In November 1975, an accord was signed with the United Kingdom to exploit the uraniferous black sands and phosphates of Abu Tartur. Uranium was identified in black sands of the Nile River delta and along the Mediterranean coast. Monazite, was the major uranium-bearing mineral in these sands, and reportedly assayed up to 5% uranium. About 26,000 tons of uranium was estimated available from this source. The Abu Tartur phosphate deposits were estimated to contain about 100,000 tons of uranium. West German companies and the Egyptian Nuclear Energy Authority were expected to reach an agreement on uranium exploitation in 1976. Feasibility studies for uranium extraction and funds for exploration were being sought.

NONMETALS

Barite.—A bulk head sample of about 100 kilograms of barite ore from the Gebel El Hudi deposits in the Eastern Desert was tested, with the conclusions that the ores can be successfully dressed under certain conditions.[6] Three products were obtained through treatment in two stages: (1) crushing, grinding, and attrition scrubbing; and (2) concentration with hydroclassification

[5] The Washington Post (Washington, D.C.). Egypt's Large Steel plant is Economic Embarrassment. Oct. 11, 1976, p. A–19.

[6] Mining Magazine (London). Beneficiation of Barite Ore From Gebel El Hudi Eastern Desert, Egypt. March 1976, p. 193.

and gravity concentration by a shaking table. High-grade barite concentrate in the final product consisted of about 66.04% barite by weight, with 59.88% BaO, 1.04% SiO_2, 0.004% PbO, and 0.15% Fe_2O_3. Galena and pyrite concentrate amounted to about 2.53%. A barite slimes fraction formed about 11.25%. These slimes can be added to the high-grade barite, but will lower the grade from 59.88% to 59.40% BaO. Chemical analysis of the crushed head sample, representing all varieties of barite, showed 48.91% BaO, 12.49% SiO_2, 27.73% SO_3, and 0.94% PbO.

Cement.—In 1975, four companies manufactured cement—Egyptian Portland Cement Co. at Torah, Portland Cement Co. at Helwan, Alexandria Portland Cement Co. and the National Cement Co., both at Assiut. Cement was marketed both locally and abroad by the Egyptian Cement Office. It was planned to increase annual production capacity of the cement plants to 6 million tons, to meet domestic market requirements. The 1975 production was about 3.6 million tons. Four new cement factories were planned with a total capacity of 3.2 million tons per year. Aided by Kuwait, a 1-million-ton capacity cement plant was under construction in Red Sea Province. The Suez Cement Co., a private, joint-stock company incorporated in Egypt, was planning to build a 1-million-ton-per-year cement plant near Suez City. The U.S.S.R. was financing modernization of the Assiut cement factory. The World Bank lent $40 million to extend the Egyptian Portland Cement Co.'s plant at Torah, increasing capacity to 700,000 tons per year. The extension was to cost $93 million. The KFAED was to provide $23 million in the Torah project.

Gypsum.—A new deposit of gypsum was found 50 kilometers south of El Hamman on the northwestern coast of Egypt. About 550,000 tons of gypsum was mined at El Ballah.

Phosphates.—In an economic and technical agreement signed with Romania, Egypt was to receive help for accelerating development of the phosphate mine at Hamrawayn. The new underground mine was expected to be fully operational in 1976; it was a $200 million joint venture planned to yield 600,000 tons per year of marketable phosphate rock from an annual mine output of about 1.3 million tons. One million tons was to be exported to Romania as repayment. Proven ore was estimated at 38.5 million tons, 60% of which was below water level. The project was to employ 2,250 workers.

Protocols were being signed for the sale of at least 60% of anticipated production from the remote Abu Tartur deposits. It was estimated that the phosphate could be railed to the Red Sea for about $12.00 per ton, f.o.b. Development of Abu Tartur was to begin after financing was settled and a consultant for the joint venture operation was selected. Plans call for construction of a 500,000-ton-per-year pilot operation with 1980 as the target date. Mine facilities will process 10 million tons per year of ore to produce 7 million tons per year concentrated product. The phosphate deposit consists of a single, nearly horizontal, phosphorite bed that is nearly uniform in thickness and composition. The average thickness is 4 to 4.5 meters, with 170 to 288 meters overburden. A composite ore sample indicated 25% P_2O_5. Reserves were estimated at 1 billion tons and further exploration was expected to confirm much larger reserves. Beneficiation ore tests were conducted by the U.S.S.R. A 33.5% P_2O_5 concentrate was obtained at a recovery rate of 72.5%. Infrastructure costs, including a 520-kilometer railway to the Red Sea, a shipping port, and power transmission lines, were expected to approach $1 billion.

Salt and Soda.—Using nearby salt and limestone, the first heavy chemicals and caustic soda manufacturing plant started production in 1959 under the name of Misr Chemical Manufacturing Co., and was the first of its kind in the Middle East and Africa. The country's consumption of caustic soda amounted to 75,000 tons in 1975. The annual consumption of sodium carbonate and sodium bicarbonate, both of which were imported, was 45,000 tons and 5,000 tons, respectively. The plant uses the Solvay chemical method. Misr Chemical proposed a sodium silicate unit to be established within the 1975–80 plan period, and affiliated with the sodium carbonate factory. Doubling the sodium carbonate factory capacity was also proposed. A new plant, which went into production at the end of January 1975, was estimated to have a capacity of 100,000 tons of crude sodium carbonate, which can be processed into 45,000 tons of caustic soda, 5,000 tons of sodium bicarbonate, and 32,000 tons of heavy sodium carbonate per year. The new plant employed 100 technicians and cost about $36 million to build. Krebs, an independent French engineering and contracting firm was considering a project to expand the Alexandria soda ash plant.

Stone.—*Building Stone.*—The Egyptian Authority for Investments approved the establishment of a new company that was to fabricate products from granite and alabaster; Egypt, Kuwait, and Switzerland were the major investors. Construction of the plant was to begin in 1977. A factory for making silico-limestone bricks was being constructed with aid from West Germany. Geologic research was being done along the Suez Canal area to identify size of reserves and the best exploitation areas for sand, gravel, and limestone. New areas for mining alabaster blocks were delineated east of Assiut. Since 1973, the demand for granite quarrying licenses at Aswan has increased, as have licenses for sand, gravel, and limestone in other areas.

MINERAL FUELS

Coal.—Coke output from the Coke and Basic Chemicals factory increased 61.3% in 1974 to 500,000 tons, a result of operation of the third blast furnace at Helwan. A third coke line was to start production in 1976, raising the yearly production to 700,000 tons of coking coal and providing employment for 1,500 workers. Small coal deposits were located in the Sinai Peninsula, in the Maghara region near the northern coast, and at Kharga and Bahariya Oasis, but if mined, these would not be sufficient to supply coking coal requirements for the Helwan iron and steel industry. All coal needs were imported.

Natural Gas.—Abu Gharadia natural gasfield in the Western Desert was expected to be available for commercial use in 1976. A pipeline connecting the field to production plants was under construction. The gasfield was to produce 105.6 million cubic feet of gas per day and was to be used in cement, steel, and fertilizer plants at Helwan.

The Abu Madi gasfield, which was to supply feedstock for the Talkha fertilizer plant, was inaugurated on February 25, 1975.[7] In early March 1975, Abu Madi began production at a capacity of 3.5 million cubic feet of gas per day, and was expected to reach full capacity within a few months. The gas was to be conveyed by pipeline to the fertilizer plant for production of ammonium nitrate and urea fertilizer. The gasfield was also to serve the Mahallat al-Kuba industrial area. The Talkha plant was under construction and scheduled for completion by 1978, when it will produce 1,200 tons per day of ammonia and 1,700 tons per day of urea.

Work had started on laying pipelines from the Abu Qir offshore gas wells to serve the proposed chemical fertilizer plant and existing factories at Abu Qir, as well as to serve the growing industrial complex at Kafr Al Dawar, 24 kilometers to the south. The gasfield was to produce about 3 million cubic meters per day, and the pipeline was to be completed by yearend 1977. The pipeline was to cost about $125 million. The Abu Qir fertilizer plant was to produce 1,200 tons per day of ammonia and urea, as well as 500 tons per day of phosphoric acid from its phosphate unit.

Petroleum.—*Exploration.*—Egypt had finalized some 30 exploration agreements by May 31, 1975, and the Egyptian General Petroleum Corporation (EGPC) was forecasting gas and oil exploration expenditures of about $75 million per year over the next 10 years. The increase in exploration interest was a result of the more liberal policy adopted in the last 2 years which was based on production sharing agreements. Under the terms of these agreements, the foreign operating company must make minimum expenditures on prospecting during an initial period, which may be as much as 6 to 8 years and when oil is found, must undertake a 20- to 30-year production period. The company is then allowed to recover its actual expenses from production proceeds and a joint stock company is formed with EGPC. In nonproductive areas, concession areas are leased in 500-square-kilometer blocks; in productive areas, the leased blocks are 36 square kilometers each. Exploration agreements concluded between EGPC and foreign oil companies as of February 29, 1976[8] are shown on table 2.

Oil exploration areas are divided into six general regions, each described on the following page in order of importance.

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[7] U.S. Embassy, Alexandria, Egypt. State Department Airgram A-64, Apr. 23, 1975, 9 p.

[8] U.S. Embassy, Alexandria, Egypt. State Department Airgram A-019, Mar. 17, 1976, 21 p.

1. Gulf of Suez: An extensively explored area of 20,000 square kilometers, extending from Suez down to latitude 30° N at Ghurdaga on the Red Sea coast. Nineteen fields have been discovered with proven reserves of 2.4 billion barrels of oil. Companies with petroleum concession agreements in this region included Transworld International, American Oil Co. International (AMOCO), Deminex (West Germany), Chevron Oil Corp., Shell International Petroleum Co., Ltd., British Petroleum (BP), the General Petroleum Co. (GPC), Compagnie Orientale des Petroles d'Egypt (COPE), Egyptian Petroleum Development Co. (Epedeco) (Japanese consortium), Gulf of Suez Petroleum Co. (GUPCO), International Egyptian Oil Co. (I.E.O.C.), a subsidiary of Ente Nazionale Idrocarburi (ENI), Mobil Oil Co., and Texaco.

2. Red Sea: Extends from Ghurdaga to the Sudan border and covers approximately 25,000 square kilometers. Only a few exploratory wells have been drilled. Seismic work has been done and more drilling was anticipated. Companies with exploration permits included: Union Oil Co., Phillips Petroleum Co., Hispanoil, and Exxon Corp.

3. Western Desert: Extends from latitude 25° N to the Mediterranean and from the Libya border to the Nile Delta. Five commercial discoveries have been made, including El-Alamein, Yidma, Abu Gharadiq, El-Rassak, and Site WD–33. Proven reserves were 190 million barrels of oil and 2,119 million cubic feet of gas at Abu Gharadiq. Companies holding petroleum concession permits included Chevron Oil Co., Atlantic Richfield Co. (ARCO), Mobil, Petroswede Oljeprospektering AB (Petroswede), Faiyum Petroleum Co. (FAPCO), Pexamin Pacific, Inc., Nile Valley Petroleum Co. (NIPCO), Shell Oil Co., Blaspetro, LVO Corp. of the United States, AMOCO, and Phillips Petroleum Co.

4. Nile Delta: This is an area of 36,000 square kilometers north of Cairo that includes an offshore zone. Twenty-two wells have resulted in four gas strikes at Abu Qir, Abu Madi, El-Wasaani, and the noncommercial Boseli strike. Companies holding petroleum and gas concession permits included Continental Oil Co. (CONOCO), I.E.O.C. Exxon, Mobil, Elf-Aquitaine, ERAP, ENI, AGIP S.p.A., and Marathon Petroleum Egypt Ltd.

5. Nile Basin: This is an area of 10,000 square kilometers extending from latitude 24° N to Cairo where four exploratory wells have been drilled with no finds. Companies holding exploration permits included NIPCO, Transworld International, Santa Fe International, and Blaspetro.

6. North Sinai Peninsula: This area covers 40,000 square kilometers including an offshore zone. Six exploratory wells have been drilled with no finds. Companies with interests in petroleum concessions included Mobil and ENI. Under the second-stage disengagement agreement concluded with Egypt in 1975, the Israelis returned several Sinai oilfields to Egypt. An Israeli rig was drilling in southern Sinai at El Tor near the Egyptian El Morgan oilfield in the Gulf of Suez. This drilling was part of an intensive search for oil that Israel was conducting as a result of its agreement to return the Sinai oilfields. Government-controlled concerns were also drilling in northeastern Sinai.

During 1975, Epedeco, a Japanese consortium led by North Sumatra Oil Development Corp. and Japan Petroleum Drilling Co. initialled a production sharing agreement on 527 square kilometers west of Bakr Field in the Gulf of Suez area. Final agreements were also signed with the Elf-ERAP-Aquitaine group of France. ELF's production sharing with EGPC would be 70% to 85% for EGPC after development and exploration costs were recovered from 40% of annual production. Marathon Oil was taking a 25% share in 13,000 square kilometers of the Nile Delta area with CONOCO (25%) and ENI (50%). Marathon was also holding an equal share with the same companies farther south in a 8,500-square-kilometer area. AMOCO received permission to explore in the Suez Canal areas covered by original agreements, but which were not accessible before 1973, in exchange for changes in production sharing agreements. Three new finds were made in the Gulf of Suez area. Two of the discoveries were made by AMOCO (a subsidiary of Standard Oil of Indiana). The first strike made by AMOCO was located 7 miles west of the Gulf of Suez at 11,177 feet. Preliminary tests indicated 3,676 barrels of crude per day. The company was to drill six wells in the concession. Another AMOCO strike was made 2 miles north of Ras Shukair on the Red Sea at 6,360 feet,

Table 2.—Egypt: Exploration agreements finalized between EGPC and foreign companies

Company	Date of agreement	Acreage (square kilometers)	Signature (S) and production (P) bonuses (million dollars)		Exploration commitments (million dollars)	Production sharing (percent)
Elf-ERAP	March 1975	2,200 (off Alexandria)	$2.5	(S)	$37.5	70/85-30/15.
Epedeco-North Sumatra Oil.	May 18, 1975	527 (on western shore of Suez Gulf).	3 9	(S) (P)	21 (over 6 years)	Up to 87%.
Exxon	December 1974	12,000 (in Red Sea offshore)	4.5 6	(S) (P)	(12 years)	70/30-80/20 (depending on water depth).
Do	December 29, 1973	15,000 (in Nile Delta offshore)	--		50 (over 12 years)	NA.
Mobil	July 21, 1974	2,250 (near Hurghada in Suez Gulf offshore).	6 12	(S) (P)	21.5 (over 8 years)	80-20.
Do	December 1974	5,300 (in Sallum area in Western Desert).	9	(P)	8.25 (over 8 years)	80-20.
Do	December 29, 1973	6,500 (in Nile Delta offshore)	2.5	(S)	23 (over 8 years)	Varies with output and water depth.
Petroswede	December 1974	4,000 (in Western Desert Natrun).	.5 6	(S) (P)	10.5 (over 8 years)	80-20.
Pexamin-Pacifi-LVO.	May 28, 1974	8,000 (in Western Desert)	.5	(S)	9 (over 8 years)	75-25.
Phillips-Hispanoil	December 1974	12,000 (in Red Sea offshore and and onshore (Quseir)).	1 6	(S) (P)	45 (over 7-9 years)	80-20.
Santa Fe	do	4,000 (east of Cairo)	1 10	(S) (P)	18 (over 7 years)	80-20.
AMOCO	July 21, 1974	100 (in Suez Gulf)	3 7	(S) (P)	2 (over 2 years)	80-20.
Do	December 1974	600 (in Suez Gulf offshore (South Beloyim)).	8.5 12	(S) (P)	20.5 (over 7.5 years)	85-15.
Do	do	1,320 (in Western Desert (South Gharah)).	12 12	(S) (P)	29 (over 7.5 years)	85-15.
Atlantic Richfield	December 1974	3,320 (in Western Desert (Marsa Matruh)).	2 6	(S) (P)	11 (over 8 years)	85-15.
Braspetro	Aug. 26, 1973	18,000 (in Nile Valley and Eastern and Western Deserts).	--		14.4 (over 8 years)	50-50 (joint venture).
Chevron	December 1974	6,900 (in Western Desert (Qattara)).	2 14	(S) (P)	17 (over 7 years)	80-20.
CONOCO-IEOC	Mar. 26, 1974	13,000 (in Nile Delta offshore and onshore).	--		20 (over 8 years)	75 (oil onshore). 75 (oil offshore). 67.5-32.5 (gas).

See footnote at end of table.

Table 2.—Egypt: Exploration agreements finalized between EGPC and foreign companies—Continued

Company	Date of agreement	Acreage (square kilometers)	Signature (S) and production (P) bonuses (million dollars)	Exploration commitments (million dollars)	Production sharing (percent)
Continental-Delta	May 20, 1974	8,500 (in South Nile Delta)	6 (P)	23 (over 10 years)	75-25 (oil). 65.5-32.5 (gas).
Deminex	Feb. 2, 1974	2,000 (in Suez Gulf offshore)	3 (S)	22 (over 8 years)	80-20.
Shell-BP-Deminex	December 1974	1,350 (in Suez Gulf offshore (North Belayim)).	7.5 (S) 12 (P)	26 (over 7 years)	82.5-17.5.
Shell-Winning NV	do	8,500 (in Western Desert (al-Daba)).	3 (S) 8 (P)	39.5 (over 8 years)	80-20.
Do	do	6,400 (in Western Desert (Sidi Barrani)).	2.5 (S) 8 (P)	25.5 (over 8 years)	80-20.
Transworld International.	Aug. 28, 1973	100 (in Suez Gulf offshore)	--	5.625 (over 4 years)	75-25.
Do	Mar. 26, 1974	7,300 (in Nile Valley (between Beni-Suif and Minia)).	--	9 (over 6 years)	75-25.
Union Oil	July 21, 1974	10,000 (in Red Sea offshore)	5.5 (S) 10 (P)	30 (over 7 years)	85-15.
GISI Med	Jan. 31, 1975	30,000	(1)	(1)	(1).

NA Not available.
[1] Speculative seismic and international bidding.

and yielded 2,660 barrels per day of crude. A third strike, made by Deminex of West Germany on the Gulf of Suez, yielded 3,700 barrels per day and was expected to yield more when in full production.

Production.—On February 18, 1975, the Ramadan oilfield in the Gulf of Suez was inaugurated. Production in the field started in January with the first well testing out at 26,000 barrels per day. The petroleum-bearing formation is 1,427 feet thick. Eight new wells were drilled in 1975, and were expected to yield 100,000 barrels per day by yearend, and 200,000 barrels per day after full development. Crude oil from 1 acre was estimated at 286,000 barrels, compared with 279,000 barrels from Morgan Field, and 254,000 barrels from the July Field. Renewed production along the Red Sea, return of the Sinai oilfields, and recently reported finds supported the Government estimate of a more than twofold production increase in 1976 over 1975. AMOCO signed new production sharing terms covering the July, Morgan, and Ramadan operations, allowing AMOCO to recover costs from up to 40% of the production and to divide the rest in the proportion of 83% to Egypt and 17% to AMOCO for 2 years, with an 85%–15% split thereafter. Three oilfields in the Ras Sudr area of the Sinai were transferred to Egyptian management on October 10. American engineers of Mobil, which have an interest in fields owned by EGPC were operating some of the wells. ENI was operating 86 wells in the Abu Rudeis Field. Oilfields returned included Abu Rudeis, Belayim onshore and offshore, Sidri, Feiran, and Ekma, which are about 150 kilometers south of Suez and were operated in 1967 by Compagnie des Petroles d'Egypte, a 50–50 joint venture between ENI and EGPC; and the Asl, Matarma, and Sudr Fields which are about 40 kilometers south of Suez and were owned by EGPC.

Refining, and Petrochemicals.—Fertilizer-oriented petrochemical projects were materializing faster than base materials and plastics. Egypt was encountering financing problems for its petrochemical development. Initial plans called for a $1 billion, seven-unit olefins complex together with a $150 million aromatics complex. The first phase of the petrochemical complex was to consist of units producing 100,000 tons per year of low-density polyethylene, 30,000 tons per year of high-density polyethylene, and 60,000 tons per year of polyvinyl chloride. The $250 million complex was to be situated at either Suez or Alexandria. The Agency for International Development (AID) was to fund the paraxylene-DMT project, costing $40 million. A new petroleum refinery was planned for Alexandria in conjunction with a petrochemical complex using the natural gas of Abu Qir. A factory for butane bottles was constructed at Dahshour, starting service in 1976, and using gas from the Abu Gharadiq deposit. Petroleum refining capacity was about 250,000 barrels per day in 1975. Egypt produced about 30% to 40% of its lube oil needs. To serve the expanded Mustrurud and Suez refineries, EGPC was to build a pipeline from Ras Shukair to Cairo and Suez. The pipeline project was only in the design stage.

The Mineral Industry of Finland

By Joseph B. Huvos [1]

Having no energy sources other than some hydroelectric power, wood, and peat, Finland remained a modest producer of mineral commodities by world standards in 1975. The most important mineral products were as follows, with approximate percentages of world production: Vanadium, 5.9%; cobalt metal refined, 3.9%; nickel, 0.6%; and copper, 0.5%. Production of other mineral commodities important only to the national economy were iron and steel, asbestos, cement, feldspar, mixed fertilizer, talc, wollastonite, and zinc. The country's gross national product (GNP) was $26.3 billion,[2] of which industry contributed $12.1 billion. The value of production in million U.S. dollars and approximate employment figures in thousands in the principal sectors of the mineral industry in 1975 are shown in the following tabulation:

Sector	Value (millions) p	Employment (thousands)
Mining and quarrying	$162	6
Base metal production	650	16
Nonmetallic mineral processing	425	21
Chemical industry [1]	1,245	35

p Preliminary.
[1] Includes petroleum and asphalt industry.
Source: Central Statistical Office of Finland, Helsinki; Bulletin of Statistics, No. 3, 1976, p. 8; and Statistical Yearbook of Finland, 1973.

Mineral industry sales were affected to various degrees by the 1975 international recession, higher oil prices, and slackening demand in western buyer countries. The mineral processing sector was the most strongly affected; however, production at mines increased slightly, and stocks at mines also increased.

Finland's small mineral exports of metals and nonmetallic minerals went mainly to Western Europe. Principal mineral commodities imported were crude oil and petroleum products from the U.S.S.R., the Middle East, Venezuela, and the Common Market countries. Coal and coke came from the U.S.S.R., Poland, and Western Europe; phosphate, mainly from the U.S.S.R.; sulfur from France, Poland, and the United States; iron ore, mainly from Sweden and Norway; and scrap iron from the U.S.S.R. and Western Europe.

Significant developments in Finland's mineral industry in 1975 included commissioning of an iron ore mine and a blast furnace; and completion of additional capacity at a sulfuric acid plant and at two oil refineries. In addition, development continued at a chromium and an iron-vanadium mine, and construction continued at a stainless steel plant.

Rautauruukki Oy decided to proceed with development of the Savukoski phosphate deposits at Sokli, northeastern Lapland, and Kemira Oy started a feasibility study of a similar project located at Siilinjärvi, Kuopio Province. Finally, the Finnish Government allocated $23 million for fuel research, with the emphasis on peat utilization.

[1] Physical scientist, International Data and Analysis.
[2] Where necessary, values in Finland marks (Fmk) were converted to U.S. dollars at the rate of Fmk3.6867=US$1.00 for 1975 and Fmk3.774=US$1.00 for 1974. Gross National Product reported in Kansallis-Osake-Pankki Economic Review (Helsinki), No. 1, 1976, p. 33.

PRODUCTION

Finland's mineral industry is modest by world standards, but it is advanced and well integrated. Volume indices for production in the principal sectors of the mineral industry and for all industry are shown in the following tabulation:

Sector	1970=100	
	1974 [r]	1975 [p]
Mining and quarrying	97	110
Nonmetallic mineral processing	144	125
Basic metals industry	139	133
Chemical industry	160	154
Petroleum refining [1]	107	96
Electric, gas, and water industry	133	130
All industry	129	121

[p] Preliminary. [r] Revised.
[1] Includes rubber and plastics.

Source: Central Statistical Office of Finland, Helsinki; Bulletin of Statistics, No. 3, 1976, pp. 8–9.

Production of mineral commodities is detailed in table 1.

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

Commodity	1973	1974	1975 [p]
NONMETALS			
Aluminum, secondary	4,900	5,300	4,500
Cadmium, refined metal	179	156	217
Chromium, chromite:			
Gross weight:			
Concentrate	135,203	126,242	131,567
Foundry sand	12,307	28,419	33,026
Chrome oxide content:			
Concentrate	57,461	53,148	52,890
Foundry sand	5,809	13,300	15,291
Cobalt:			
Mine output, metal content [e]	1,300	1,300	1,257
Metal, refined	1,010	812	821
Copper:			
Mine output, metal content	38,213	36,667	38,800
Metal:			
Primary:			
Blister	48,100	48,400	46,238
Electrolytic	42,907	38,277	35,764
Secondary (unrefined)	18,771	17,014	11,335
Gold metal troy ounces	19,773	20,737	22,216
Iron and steel:			
Iron ore:			
Magnetite, concentrate thousand tons	589	569	376
Pelletized iron oxide (from pyrite) do	164	236	280
Roasted pyrite do	143	132	138
Pig iron do	1,412	1,381	1,368
Ferrochromium do	40	48	40
Steel:			
Crude:			
Ingots do	1,615	1,617	1,579
Castings do	18	39	89
Semimanufactures (rolled) do	1,135	1,124	1,087
Lead, mine output, metal content do	2,128	1,478	929
Mercury 76-pound flasks	[r] 192	183	309
Nickel:			
Mine output, metal content	5,760	5,762	5,404
Sulfate, metal content	220	186	207
Metal, electrolytic	5,839	6,455	6,544
Platinum metal [e] troy ounces	725	650	600
Selenium metal kilograms	9,171	9,690	8,477
Silver metal troy ounces	793,351	810,712	743,839
Titanium concentrate, ilmenite, gross weight	159,000	152,000	122,600
Vanadium:			
Gross weight	2,248	2,647	2,276
Vanadium content	1,259	1,483	1,275
Zinc:			
Mine output, metal content	58,592	58,837	52,751
Metal	80,662	91,786	109,885
Semimanufactures	264	203	122

See footnotes at end of table.

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

Commodity	1973	1974	1975 p
NONMETALS			
Asbestos	6,337	5,593	2,788
Cement, hydraulic ---- thousand tons	2,092	2,203	2,063
Feldspar	58,318	63,577	68,577
Fertilizer materials:			
Natural:			
Phosphate (apatite) ---- thousand tons	--	--	114
Manufactured:			
Nitrogenous ---- do	321	311	NA
Phosphatic (superphosphate) ---- do	77	62	NA
Mixed and other ---- do	1,015	1,085	NA
Lime ---- do	233	245	259
Pyrite:			
Gross weight ---- do	r 789	722	718
Sulfur content ---- do	r 357	341	329
Stone:			
Limestone and dolomite:			
For cement ---- do	2,909	3,202	2,861
For lime ---- do	446	512	482
For sulfite and metallurgical uses ---- do	153	144	128
Other ---- do	838	774	893
Quartz ---- do	93	120	105
Sulfur, byproduct (recovered):			
Elemental	122,715	99,589	84,409
Gaseous (in SO_2)	240,540	246,685	261,624
Talc	109,704	128,269	124,260
Wollastonite	6,547	9,118	13,089
MINERAL FUELS AND RELATED MATERIALS			
Coke, all types ---- thousand tons	67	--	--
Gas, manufactured ---- million cubic feet	1,572	918	NA
Peat:			
For fuel use ---- thousand tons	240	116	200
For agricultural and other use ---- do	155	127	165
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	12,786	11,994	11,837
Jet fuel ---- do	1,126	1,285	1,665
Kerosine ---- do	55	--	134
Distillate fuel oil ---- do	18,310	18,067	18,517
Residual fuel oil ---- do	23,523	25,085	20,833
Liquefied petroleum gas ---- do	1,877	1,098	983
Other ---- do	3,089	3,661	2,726
Refinery fuel and losses ---- do	5,424	5,445	3,402
Total ---- do	66,190	66,635	60,097

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

TRADE

There was no significant change in the pattern of Finland's foreign trade. The country had a trade deficit of $2.1 billion or 8% of the gross national product in 1975.[8]

The principal mineral commodities, exported mostly to Western Europe, were iron and steel, cobalt, copper, nickel, vanadium, zinc, asbestos, feldspar, and talc. Mineral commodity imports were valued at about two-thirds and fuels about 6% of all imports of the country. Fuels were supplied mostly by the U.S.S.R. and Poland. Finland's mineral commodity trade in 1973 and 1974 is shown in tables 2 and 3.

[8] Page 39 of work cited in footnote 2.

Table 2.—Finland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys:		
Scrap	69	34
Unwrought	1,484	903
Semimanufactures	r 12,249	14,212
Arsenic trioxide, pentoxide, and acids	--	18
Cadmium metal including alloys, all forms	176	241
Chromium, chromite	30,446	83,942
Cobalt metal, unwrought and semimanufactures	991	808
Copper:		
Ore and concentrate	2	--
Metal including alloys:		
Scrap	3	365
Unwrought including matte	24,492	12,192
Semimanufactures	r 15,258	14,212
Gold metal, unworked or partly worked troy ounces	93	701
Iron and steel:		
Ore and concentrate, except roasted pyrite	--	22
Roasted pyrite	--	11
Metal:		
Scrap	6,383	8,445
Pig iron, ferroalloys, spiegeleisen, similar materials	180,506	217,979
Steel, primary forms	230,164	240,409
Semimanufactures	r 297,479	210,453
Lead:		
Ore and concentrate	11,627	3,803
Metal including alloys:		
Scrap	216	1,140
Unwrought	88	195
Semimanufactures	8	28
Mercury 76-pound flasks	209	35
Nickel metal including alloys:		
Unwrought	5,618	5,509
Semimanufactures	33	--
Platinum-group metals including alloys troy ounces	219	537
Silver metal including alloys thousand troy ounces	1,188	970
Tin metal including alloys:		
Scrap	23	--
Unwrought	39	21
Semimanufactures	(1)	5
Titanium:		
Ore and concentrate	--	1
Oxides	1,773	1,814
Uranium oxides	2,354	2,681
Zinc:		
Ore and concentrate	--	7,091
Oxide	3	7
Metal:		
Scrap	139	633
Unwrought	64,966	67,017
Semimanufactures	4,355	2,283
Other:		
Ash and residue containing nonferrous metals	10,878	4,777
Waste and sweepings of precious metals kilograms	6,409	19,071
Base metals, n.e.s	13	25
NONMETALS		
Asbestos	5,225	4,867
Borates, crude, natural	(1)	438
Cement	173,823	65,857
Abrasives, natural n.e.s.:		
Pumice	298	16
Grinding and polishing wheels and stones	85	24
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s.:		
Kaolin	2	4
Other	318	167
Clay products:		
Refractory	491	778
Nonrefractory	1,407	2,959
Cryolite and chiolite	--	10
Diamond, gem, not set or strung carats	2,500	1,000
Diatomite and other infusorial earth	115	34
Feldspar	40,993	46,369
Fertilizer materials, manufactured:		
Nitrogenous	r 74,758	22,617
Potassic	(1)	14,232
Other including mixed	53,750	25,539

See footnotes at end of table.

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

Commodity	1973	1974
NONMETALS—Continued		
Graphite	15	(1)
Lime	35	694
Magnesite	--	16
Mica, all forms	--	30
Precious and semiprecious stones, except diamond:		
Natural .... kilograms	542	14
Manufactured .... do	(1)	(1)
Salt (excluding brine)	18	7
Sodium and potassium compounds, n.e.s., caustic soda	606	1,961
Stone, sand and gravel:		
Dimension stone	r 29,386	39,914
Other stone:		
Dolomite	383	804
Limestone	16,075	17,909
Quartz and quartzite	386	564
Crushed broken stone and gravel, n.e.s	17,933	55,605
Sand excluding metal bearing	537	929
Sulfur:		
Elemental, all forms	31,022	20,204
Sulfuric acid	93,157	57,202
Talc and steatite	5,668	1,855
Other nonmetals, n.e.s.:		
Slag dross, and similar waste, not metal bearing:		
From manufacture of iron and steel	6,223	3,811
Slag and ash, n.e.s	428	491
Building materials of asphalt, asbestos, and fiber cement and unfired nonmetals, n.e.s	3,657	6,594
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural briquets	147	4
Carbon black	(1)	2
Coal, all grades, including briquets	--	40
Coke and semicoke	23,592	9,269
Hydrogen, helium, rare gases	--	(1)
Peat including peat briquets and litter	16,376	16,796
Petroleum refinery products:		
Gasoline .... thousand 42-gallon barrels	926	2,213
Distillate fuel oil .... do	477	9
Lubricants .... do	17	33
Other:		
Liquefied petroleum gas .... do	10	12
Naphtha .... do	(1)	--
Mineral jelly and wax .... do	2	7
Nonlubricating oils, n.e.s .... do	1	1
Bitumen and bituminous mixtures, n.e.s .... do	2	4
Unspecified .... do	(1)	(1)
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	2,544	--

r Revised.
1 Less than ½ unit.

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

Commodity	1973	1974
METALS		
Aluminum:		
Ore and concentrate	2,944	2,000
Oxide and hydroxide	r 28,339	21,683
Metal including alloys:		
Unwrought	19,943	25,619
Semimanufactures	24,483	31,299
Antimony metal including alloys, all forms	32	77
Arsenic trioxide, pentoxide, acids	500	723
Cadmium metal including alloys, all forms	1	(1)
Chromium:		
Chromite	505	170
Oxide and hydroxide	592	645
Cobalt:		
Oxide and hydroxide	1	1
Metal including alloys, all forms	2	21
Copper:		
Ore and concentrate	3,091	36,265
Copper sulfate	1,949	3,853

See footnotes at end of table.

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

Commodity	1973	1974
METALS—Continued		
Copper—Continued		
Metal including alloys:		
Scrap	--	22
Unwrought	r 9,249	15,748
Semimanufactures	9,962	10,939
Gold metal, unworked or partly worked troy ounces	112,171	87,649
Iron and steel:		
Ore and concentrate, except roasted pyrite	947,840	1,133,316
Metal:		
Scrap	r 61,797	84,795
Pig iron including cast iron	9,847	40,006
Sponge iron, powder, shot	3,046	4,995
Ferroalloys	25,788	27,601
Steel, primary forms	18,210	6,725
Semimanufactures:		
Bars, rods, angles, shapes, sections	279,100	369,137
Universals, plates, sheets	273,410	220,403
Hoop and strip	51,960	64,053
Rails and accessories	2,550	4,154
Wire	15,726	19,384
Tubes, pipes, fittings	155,132	153,689
Castings and forgings, rough	1,176	1,977
Lead:		
Ore and concentrate	--	112,326
Oxides	359	409
Metal including alloys:		
Unwrought	10,129	13,548
Semimanufactures	919	1,100
Magnesium metal including alloys, all forms	15	81
Manganese:		
Ore and concentrate	44	29,652
Oxides	900	934
Mercury 76-pound flask	383	670
Molybdenum metal including alloys, all forms	5	4
Nickel:		
Ore and concentrate	10,303	12,608
Metal including alloys:		
Srap	--	34
Unwrought	133	1,528
Semimanufactures	133	160
Phosphorus	13	10
Platinum-group metals thousand troy ounces	r 10	8
Silver metal including alloys do	2,873	3,464
Silicon	321	356
Tin:		
Oxides	7	8
Metal including alloys:		
Unwrought	r 316	386
Semimanufactures	111	143
Tungsten:		
Ore and concentrate	1	2
Metal including alloys, all forms	13	21
Zinc:		
Oxides	398	550
Metal including alloys:		
Scrap	342	526
Unwrought	1,787	1,096
Semimanufactures	r 785	877
Other:		
Ore and concentrate	171	20,956
Ash and residue containing nonferrous metals	12	243
Metal including alloys, all forms:		
Metalloids, n.e.s	15	5
Pyrophoric alloys	1	2
Base metals, n.e.s	247	522
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	156	183
Dust and powder of precious and semiprecious stones, except diamond kilograms	3	4
Grinding and polishing wheels and stones	2,326	2,491
Asbestos	4,911	6,172
Barite and witherite	1,783	2,688
Borates, crude, natural	10,263	11,350
Cement	88,329	84,882
Chalk	11,447	10,445

See footnotes at end of table.

Table 3.—Finland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s.:		
Kaolin	318,108	379,203
Other	20,675	42,491
Products:		
Refractory (including nonclay bricks)	r 53,838	67,905
Nonrefractory	1,603	5,319
Cryolite and chiolite	58	79
Diamond:		
Gem, not set or strung ... carats	1,000	--
Industrial ... do	24,000	25,000
Diatomite	854	1,361
Feldspar, leucite, nepheline syenite	15	37
Fertilizer materials:		
Crude phosphatic	591,225	570,009
Manufactured:		
Nitrogenous	17,929	27,215
Phosphatic	713	90
Potassic	283,476	286,396
Other including mixed	4,706	4,444
Ammonia	75,133	86,857
Fluorspar	4,208	5,191
Graphite, natural	389	824
Gypsum and plasters	135,346	184,608
Lime	2,231	1,462
Magnesite	2,446	2,527
Mica, all forms	270	303
Pigments, mineral:		
Natural, crude	118	149
Iron oxides, processed	2,475	3,350
Precious and semiprecious stones, except diamond:		
Natural ... kilograms	2,629	3,444
Manufactured ... do	158	146
Salt (excluding brine)	492,188	648,276
Sodium and potassium compounds n.e.s.:		
Caustic soda	19,711	1,975
Caustic potash	289	431
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	364	646
Worked	r 223	216
Dolomite, chiefly refractory grade	6,943	10,817
Gravel and crushed rock	3,785	107,442
Limestone except dimension	r 335,173	421,711
Quartz and quartzite	1,039	418
Sand excluding metal bearing	89,450	126,734
Sulfur:		
Elemental	28,981	36,536
Sulfuric acid	33	85
Talc and steatite	r 2,829	1,685
Other nonmetals, n.e.s.:		
Crude	2,223	1,766
Slag, dross and similar waste, not metal bearing:		
From iron and steel manufacture	2	--
Slag and ash, n.e.s	100	20
Oxides and hydroxides of magnesium, strontium and barium	11,698	13,809
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals, n.e.s	2,925	4,893
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	321	399
Carbon black and gas carbon	7,099	7,029
Coal, all grades, including briquets ... thousand tons	2,973	3,940
Coke and semicoke ... do	832	979
Hydrogen, helium and rare gases	95	170
Peat including peat briquets and litter	33	554
Petroleum:		
Crude and partly refined ... thousand 42-gallon barrels	69,948	69,558
Refinery products:		
Gasoline ... do	855	749
Jet fuel ... do	48	34
Kerosine ... do	56	69
Distillate fuel oil ... do	13,194	14,463
Residual fuel oil ... do	15,008	14,112
Lubricants ... do	663	757

See footnotes at end of table.

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

Commodity	1973	1974
MINERAL FUELS AND RELATED MATERIALS—Continued		
Petroleum—Continued		
Refinery products—Continued		
Other:		
Liquefied petroleum gas ------- thousand 42-gallon barrels --	110	4,828
Naphtha ---- do ----	246	704
White spirit ---- do ----	72	51
Mineral jelly and wax ---- do ----	r 102	135
Nonlubricating oils, n.e.s ---- do ----	13	18
Bitumen and bituminous mixtures, n.e.s ---- do ----	254	381
Pitch, pitch coke, petroleum coke ---- do ----	7	11
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ---	16,059	12,707

r Revised.
[1] Less than ½ unit.

COMMODITY REVIEW

METALS

In 1975, Finland had 13 metal mines. Of these, Outokumpu Oy operated nine; Rautaruukki Oy, three; and Myllykosky Oy, one. Products extracted from various metal concentrates included copper, zinc, nickel, sulfur, iron, cobalt, precious metals, selenium, cadmium, lead, and vanadium.

Chromium.—In 1975, preparation continued to shift chromite production to Outokumpu Oy's Viianlahti-Viiaranta ore body located at Kemi, at the northern end of the Gulf of Bothnia. Actual mining continued at the 14.5-million-ton[4] Elijärvi deposit, to be depleted by 1977. Part of the chromium ore produced was processed into ferrochromium at the nearby 50,000-ton-per-year Tornio ferrochrome works operated also by Outokumpu Oy; the remainder was exported.

Cobalt.—No major changes occurred in cobalt operations in 1975. Cobaltiferous pyrites with about 0.7% cobalt from Vuonos and Keretti mines near the locality of Outokumpu, were processed at Outokumpu Oy's Kokkola plant on the Gulf of Bothnia.

Copper and Nickel.—There were no outstanding changes in copper and nickel operations in 1975. Mining continued for nickel at Outokumpu's Keretti, Viaalanti, and Virtasalmi mines in the west-central part of Finland and for copper at the Hitura, Kotalahti, and Vuonos mines and Myllykosky's Kaavi mine in the same area. Concentrates were smelted mostly at Outokumpu's Harjavalta plant on the west coast, and electrolytically refined at the nearby Pori refinery.

Iron Ore.—In 1975, major events included commissioning of Rautaruukki Oy's Rautavaara mine located in Finnish Lapland. Another plant to produce iron ore pellets as a byproduct of vanadium ore processing at Rautaruukki Oy's Mustavaara mine was scheduled for commissioning in 1976. In addition, during 1975, Rautaruukki Oy continued to operate two iron ore mines, one at Otanmäki in central Finland, the other at Raajärvi in Finnish Lapland.

Iron and Steel.—In September 1975, Rautaruukki Oy's 1,033-cubic-meter No. 2 blast furnace, built by the U.S.S.R. at Raahe, was lit. Hot-metal capacity at the furnace is 850,000 tons per year, and is to raise the plant's total output to 1.6 million tons per year by late 1976. The furnace is part of an expansion program, which also included extensions of the steelmaking and rolling facilities due to start up in 1976.[5]

About half of Finland's pig iron and steel continued to be produced by Rautaruukki Oy's Raahe integrated steel plant near the northern end of the Gulf of Bothnia; the rest of the country's steel was produced by plants of the Ovako Group located at Immatra on the U.S.S.R. border, and at Turku and Koverhar at the southern end of the west coast.

Work continued also on Outokumpu Oy's stainless steel plant at Tornio, at the northern end of the Gulf of Bothnia, to become operational in July 1976.

Lead and Zinc.—Zinc ores continued to be mined at Outokumpu's Vuonos, Pyhasalmi, Hammaslahti, Vihanti, and Myllykoski Oy's Luikonlahti mines with some lead produced also at Vihanti. Zinc con-

[4] Outokumpu News (Helsinki). Proved Reserves. V. 12, No. 2, 1975, p. 10.
[5] Metal Bulletin (London). No. 6030. Oct. 7, 1975, p. 32.

centrates were processed at Outokumpu's 95,000-ton-per-year Kokkola electrolytic refinery on the west coast; lead concentrates were exported.

Titanium.—Finland's only source of ilmenite remained at the Otanmäki mine in the north, where a concentrate was produced as a byproduct of iron ore concentration. The concentrate was sold to Kemira Oy for processing into TiO_2 pigments at the company's Mantyluoto plant situated on the southwest coast.

Vanadium.—In 1975, Rautaruukki Oy continued construction of the Mustavaara iron-vanadium mine located in Taivalkoski parish. After startup in 1976, the mine is expected to provide an ore yielding about 3,000 tons of vanadium pentoxide and 200,000 tons of pelletized iron ore concentrate. Production of vanadium ore and vanadium pentoxide continued at Rautaruukki's Otanmäki mine in the central part of the country.

NONMETALS

Construction materials, asbestos, feldspar, mixed fertilizers, pyrites, quartz, sulfur, talc, and wollastonite were the principal products of Finland's small but advanced nonmetals industry in 1975.

Asbestos.—The country's entire anthophyllite asbestos production continued to come from Paraisten Kalkki Oy's Paakkila open pit mine located between Kuopio and Joensuu in eastern Finland. Most of the production was exported, mainly to the United States and West Europe.

Fertilizer Materials.—In 1975, Government-owned Rautaruukki Oy decided to start to develop the Savukoski, Sokli (Northeast Lapland) phosphate deposit, with plans to produce 100,000 tons of apatite concentrate per year by the end of this decade. Also in 1975, Kemira Oy was planning to develop a phosphate deposit near its fertilizer plant in Siilinjärvi, Kuopio Province. Mining of a trial quantity of 100,000 tons of ore and construction of a 10-ton-per-day pilot plant has started. Final decision for commercial operation by 1978 was expected in 1976. In 1975, phosphates imported mostly from the U.S.S.R. and North Africa continued to be processed at the Siilinjärvi fertilizer plant.

Finland's only nitrogen fertilizer producer, the State-owned Kemira Oy, continued production of ammonia and related products at its Oulu plant located on the Gulf of Bothnia. Potash was imported from France and West Germany.

Pyrite and Sulfur.—Finland's only sulfuric acid producer, Kemira Oy, completed expansion of the capacity of its Kokkola plant on the Gulf of Bothnia, from 607,000 tons to 937,000 tons per year of sulfuric acid in 1975.[6] The company continued the expansion of its Harjavalta plant in southeast Finland from 250,000 tons to 420,000 tons per year. Sulfur production continued at Outukumpu Oy's Kokkola west coast pyrite smelter in 1975. Synthetic iron oxide, electric energy, and SO_2 gas (sold to Kemira Oy for sulfuric acid) were byproducts of the oil-fueled process.

MINERAL FUELS

Hydroelectric power, industrial fuel wood, and some peat, the only primary energy sources domestically produced, supplied about one-sixth of Finland's energy requirements in 1975. The remainder was imported crude oil and petroleum products, natural gas, coal, and coke. Table 4 shows supply and apparent consumption of energy for 1974 and 1975.

Coal and Coke.—Finland's consumption of imported coal and coke, mainly from Poland, was as follows, in thousand tons:

Consuming sector	1974	1975
Coal:		
Electric power generation	1,785	1,758
Paper and wood industry	578	379
Other industries	545	535
Space heating	135	77
Locomotive fuel	14	4
Total	3,057	2,753
Coke:		
Metal reduction	888	837
Other	15	3
Total	903	840

Source: Ministry of Commerce and Industry, through U.S. Embassy, Helsinki. State Department Airgram A-42, Mar. 31, 1976.

[6] Sulphur. No. 117, March–April 1975, p. 10.

Table 4.—Finland: Supply and apparent consumption of energy-producing materials for 1974 and 1975

(Million tons of standard coal equivalent) [1]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Fuelwood, wood waste, and industrial waste [e]	Hydro-electric power
1974:						
Production [2]	3.6	--	--	--	2.1	1.5
Imports	26.3	4.8	21.0	0.5	--	(3)
Exports	.4	--	.4	(3)	--	(3)
Apparent consumption	29.5	4.8	20.6	.5	2.1	1.5
1975:						
Production [2]	3.6	--	--	--	2.1	1.5
Imports	24.8	4.6	19.3	.9	--	(3)
Exports	.2	--	.2	(3)	--	(3)
Apparent consumption	28.2	4.6	19.1	.9	2.1	1.5

[e] Estimate.
[1] 1 ton standard coal equivalent (SCE) = 7,000,000 kilocalories.
[2] Includes only primary energy.
[3] Less than ½ unit.

Source: Foreign Trade, Monthly Bulletin, December 1975, and Bulletin of Statistics, No. 3, 1976, Central Statistics Office of Finland, Helsinki, 1976.

Peat.—The Government of Finland encourages production of peat as fuel for generating power to decrease the country's dependence on energy imports. In addition to $157,000 for basic research in the utilization of peat, the Government has allocated in its 1976 budget $23 million for a state fuel center (VAPO) that will use peat as its main source of energy,[7] in addition to conducting research on methods of using peat.

Petroleum and Natural Gas.—Expansion of State-owned Neste Oy's two refineries was completed in 1975; aggregate capacity of the Porvoo refinery located 50 kilometers east of Helsinki and the Naantali refinery on the west coast was increased from 9.3 million to 15 million tons per year.

Finland continued to import all crude oil and petroleum products, including about two-thirds of all crude oil and all natural gas from the U.S.S.R. by pipeline. Oil and gas imports continued to contribute to the country's trade deficit in 1975.

Finland's consumption of petroleum products in 1974 and 1975 was as follows, in thousand tons:

Refinery product	1974	1975
Aviation fuel	172	180
Gasoline	1,180	1,200
Kerosine	15	20
Gas and diesel oil	4,045	4,200
Residual fuel oil	4,552	5,100
Other	723	730
Total	10,687	11,430

Source: Organization for Economic Cooperation and Development (OCED), Paris. Provisional Oil Statistics by Quarter. Fourth Quarter 1975 and 1976, pp. 16–21.

Hydroelectric and Nuclear Power.—Construction of four nuclear powerplants with 1.5 million kilowatts total capacity was continued by the State-owned Imatran Voima Osakeyhito (IVO) and the Finnish Industrial Power Co., Teollisuuden Voima Oy (TVO). TVO has contracts with Atomenergi, A.B., Stockholm, for two 660,000-kilowatt nuclear powerplants at Olkiluoto on the west coast. The U.S.S.R. is to deliver to IVO two units of 440,000 kilowatts each at Lovisa, 20 kilometers west of Kotka.

Finland's almost fully developed hydroelectric resources of about 7 million kilowatts continued to supply about one-sixteenth of the country's energy.

[7] U.S. Embassy, Helsinki. Department of State Telegram No. 01923, Jan. 15, 1976, p. 1.

The Mineral Industry of France

By Roman V. Sondermayer [1]

Producing modest quantities of minerals and having sizable imports, France remained among the largest processors of crude minerals in Europe during 1975. However, activities of the mineral industry were at a lower level than in 1974, reflecting the economic recession in the country and in the world.

Domestic output of crude minerals was modest by world standards, but the value of mining in France was far more significant to the country's economy than the figures indicated. Often mining was the only source of employment in a region, and the well-being of the population depended on operation of a particular mine. Closing of some marginal mines was postponed because of social consequences to the region.

The most prominent minerals and metals produced in France, with production expressed in approximate percentages of the world total, were as follows: Arsenic, 18%; diatomite, 13%; gypsum, sulfur, potash, each 11%; uranium, 9%; fluorspar and iron ore, each 7%; talc, feldspar, zinc metal, each 6%; lead metal, cement, pig iron, salt, and pumice, each 5%; alumina, cadmium, cobalt, magnesium, nitrogen, and steel, each 4%; and aluminum and bauxite, each 3%.

During 1975, the gross national product (GNP) of France, about $304.7 billion, was lower by 2% compared with that of 1974. In constant (1970) prices, inflation reached an average annual rate of 10%. Unfavorable economic conditions in France and elsewhere resulted in decreased energy consumption (the first in France since World War II), and decreased exports of metals and semimanufactured products.

Principal events in the mineral industry were construction of a pilot plant for production of alumina from alunite, startup of two ministeel plants, cessation of tin ore production, and start of production at a new 80,000-ton-per-year electrolytic zinc plant.

PRODUCTION

The latest trends in French mineral production, mostly downward, reflected economic problems in the country and in the world. According to the French publication, Annales des Mines, September-October 1976, France produced about 49.7 million tons of iron ore or approximately 9% less than in 1974; steel output was close to 22 million tons or about 5 million tons less than that of 1974; bauxite output continued to decline and in 1975 reached over 2.5 million tons or 0.4 million tons less than that of 1974; aluminum metal production of 383,000 tons was about 10,000 tons lower than that of 1974. Production of lead (151,000 tons) and zinc metal (189,000 tons) declined in comparison with that of 1974 by 15% and 35%, respectively. During 1975, production of fluorspar remained at the same levels (328,000 tons) as in 1974, when expressed in contained CaF_2. However, crude ore output (730,000 tons) was higher by about 40,000 tons, indicating mining of lower grade ores during 1975.

Table 1 shows the latest figures on French mineral production.

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[1] Physical scientist, International Data and Analysis.

Table 1.—France: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
METALS			
Aluminum:			
Bauxite, gross weight ... thousand tons	[r] 2,970	2,855	2,563
Alumina ... do	1,268	1,280	1,250
Metal:			
Primary ... do	359	393	383
Secondary ... do	124	125	107
Antimony, smelter production	2,355	3,117	2,727
Arsenic, white	6,925	6,850	[e] 7,000
Bismuth:			
Ore and concentrate, metal content ... kilograms	74,000	80,000	[e] 80,000
Metal ... do	57,000	57,000	56,000
Cadmium metal	606	644	455
Cobalt metal	759	769	702
Copper:			
Mine output, metal content	414	392	500
Metal:			
Blister (secondary)	8,784	9,298	2,803
Refined [1]	[r] 32,430	43,380	38,992
Gold:			
Mine output, metal content ... troy ounces	86,614	48,901	50,026
Metal [e] ... do	86,000	48,000	50,000
Iron and steel:			
Iron ore and concentrate:			
Gross weight ... thousand tons	54,232	54,260	49,647
Metal content ... do	15,671	16,714	15,309
Pig iron ... do	19,760	21,986	17,494
Ferroalloys:			
Blast furnace ... do	544	533	427
Electric furnace ... do	421	452	401
Steel:			
Ingots and castings ... do	25,264	27,023	21,530
Semimanufactures ... do	20,223	21,896	17,558
Lead:			
Mine output, metal content (recoverable)	25,010	22,980	22,300
Metal, refined:			
Primary	138,100	124,305	101,552
Secondary	[r] 21,535	19,167	15,364
Antimonial lead (lead content)	36,800	34,266	33,830
Total	[r] 196,435	177,738	150,746
Magnesium metal including secondary	6,994	6,531	7,532
Nickel, metal content of metallurgical products (pure nickel, ferronickel, and nickel oxide)	[r] 10,892	8,702	10,857
Silicon	37,770	41,370	34,970
Silver:			
Mine output, metal content ... thousand troy ounces	[r] 1,822	1,690	1,502
Metal (content of final smelter products) ... do	4,176	3,462	3,446
Tin concentrate, metal content	255	142	51
Tungsten concentrate, metal content	[r] 757	714	620
Uranium:			
Mine output, uranium content	[r] 1,668	1,716	1,854
Chemical concentrate, uranium content	1,515	1,608	[e] 1,700
Zinc:			
Mine output, metal content	[r] 11,797	14,583	13,810
Metal including secondary:			
Slab	257,810	276,520	181,130
Dust	9,310	9,670	8,770
NONMETALS			
Barite	110,000	109,281	92,000
Bromine, elemental	16,640	15,880	16,770
Cement, hydraulic ... thousand tons	30,588	32,340	29,588
Clays:			
Bentonite [2]	[e] 14,000	18,665	[e] 20,000
Brick and tile clay ... thousand tons	NA	10,414	NA
Ceramic and pottery clay ... do	NA	957	NA
Clay and marl for cement industry ... do	NA	15,409	NA
Kaolin and kaolinite clay, crude	[r] [e] 625,000	723,311	[e] 750,000
Kyanite and andalusite	[e] 10,000	9,852	[e] 10,000
Refractory clay, unspecified ... thousand tons	NA	1,162	NA
Diatomite	[e] 200,000	205,205	[e] 210,000
Feldspar:			
Crude	229,000	240,780	182,812
Marketable	[3] [e] 225,000	[3] 105,562	NA
Fertilizer materials:			
Crude (natural):			
Phosphatic chalk	29,000	44,856	18,233

See footnotes at end of table.

Table 1.—France: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
NONMETALS—Continued			
Fertilizer materials—Continued			
Crude (natural)—Continued			
Potash:			
Gross weight ....thousand tons..	13,247	13,362	12,235
K_2O equivalent ....do....	2,263	2,275	2,085
K_2O equivalent (marketable) ....do....	2,067	2,083	1,920
Manufactured:			
Nitrogenous, nitrogen content ....do....	1,730	1,898	1,648
Phosphatic:			
Superphosphate, gross weight ....do....	1,244	1,262	913
Thomas slag ....do....	2,584	2,915	2,164
Other ....do....	[r] 2,010	2,173	1,433
Potassic ....do....	2,039	NA	NA
Mixed, gross weight ....do....	8,581	8,926	6,708
Ammonia ....do....	1,923	2,114	1,941
Fluorspar:			
Crude	[r] 580,182	688,728	730,000
Marketable [e]	[r] 290,000	[r] 260,000	328,000
Fly ash ....thousand tons..	[e] 4,000	NA	NA
Gypsum and anhydrite, crude ....do....	[e] 6,600	6,622	[e] 6,700
Lime, quicklime and hydrated lime, including deadburned dolomite ....do....	5,017	5,103	4,393
Mica [e]	4,000	4,000	4,000
Pigments, natural mineral, iron oxides	NA	8,123	NA
Pozzolana and lapilli	719,000	759,188	689,000
Pumice	[e] 900	--	--
Quartz and glass sand:			
Quartz [4]	[e] 640,000	591,742	[e] 560,000
Glass sand ....thousand tons..	6,048	5,677	5,342
Salt:			
Rock salt ....do....	236	250	180
Brine salt ....do....	1,080	1,151	986
Marine salt ....do....	1,194	1,080	1,127
Salt in solution ....do....	3,533	3,515	3,054
Total ....do....	6,043	5,996	5,347
Stone, sand and gravel:			
Building stone:			
Granite and similar stone ....do....		818	
Limestone ....do....		1,117	
Marble ....do....	NA	259	NA
Other ....do....		8	
Crushed limestone and granite ....do....		7,032	
Dolomite:			
For agriculture		306,507	
Crude for calcining	NA	528,552	NA
Other		563,216	
Total	NA	1,398,275	NA
Limestone, agricultural and industrial:			
For agriculture ....thousand tons..		481	
For iron and steel industry ....do....	NA	10,577	NA
For lime and cement ....do....		31,831	
For sugar mills ....do....		1,138	
Total ....do....	NA	44,027	NA
Road building, foundation and ballast (other than alluvial sand and gravel):			
Ballast ....do....		118,938	
Foundation material ....do....		11,877	
Ground rock for road filler ....do....		1,635	
Paving block and curbing ....do....		114	
Slate:	NA		NA
Roof ....do....		108	
Other ....do....		2	
Other stone:			
Beach pebble ....do....		225	
Lava ....do....	[e] 10	--	--
Marl ....do....	NA	161	NA
Mine fill ....do....	NA	7,594	NA
Millstones and grindstones	[e] 400	--	--
Sand and gravel:			
Industrial sands:			
Foundry ....thousand tons..	NA	1,494	NA
Miscellaneous ....do....	NA	621	NA
Other sand and gravel (alluvial) ....do....	[e] 250,000	260,592	[e] 270,000

See footnotes at end of table.

Table 1.—France: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Sulfur:			
Byproduct:			
From natural gas ---thousand tons--	1,753	1,852	1,792
From petroleum ---do----	57	69	85
From unspecified sources ---do----	46	38	8
Total ---do----	1,856	1,959	1,885
Talc:			
Crude	225,120	309,080	285,000
Powder	257,811	298,335	241,130
MINERAL FUELS AND RELATED MATERIALS			
Asphaltic material [5]	117,561	116,166	NA
Carbon black e	160,000	160,000	170,000
Coal:			
Anthracite ---thousand tons--	7,091	5,950	5,357
Bituminous ---do----	r 18,601	16,946	17,057
Lignite ---do----	2,764	2,759	3,186
Total ---do----	r 28,456	25,655	25,600
Briquets ---do----	3,234	3,415	2,795
Coke, metallurgical ---do----	r 11,880	12,282	11,445
Gas, natural:			
Gross production ---million cubic feet--	387,753	392,697	410,249
Marketed ---do----	261,680	269,414	259,844
Natural gas liquids:			
Natural gasoline and condensate thousand 42-gallon barrels--	r 3,540	4,247	4,383
Propane ---do----	r 1,782	1,810	1,645
Butane ---do----	r 1,892	1,928	1,844
Total ---do----	r 7,214	7,985	7,872
Peat ---thousand tons--	153	186	e 200
Petroleum:			
Crude ---thousand 42-gallon barrels--	9,138	7,870	7,491
Refinery products:			
Gasoline:			
Aviation ---do----	403	394	318
Motor ---do----	142,995	142,238	138,125
Jet fuel ---do----	26,709	25,937	28,130
Kerosine ---do----	284	348	282
Distillate fuel oil ---do----	357,753	337,067	273,384
Residual fuel oil ---do----	289,504	261,101	220,486
Lubricants ---do----	8,291	9,111	7,582
Other:			
Liquefied petroleum gas ---do----	34,256	32,661	32,180
Bitumen ---do----	23,355	22,504	21,040
Unspecified ---do----	66,220	77,242	26,881
Refinery fuel and losses ---do----	53,101	41,605	60,627
Total ---do----	1,002,871	950,208	809,035

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

[1] Primary and secondary.

[2] Includes smectic clay.

[3] Consists of material for the ceramic and glass industries, and reportedly contains pegmatite.

[4] Data now include quantity for glass industry as well as for ceramic use.

[5] Excludes bituminous material.

TRADE

France's trade balance in minerals and fuels remained negative. During 1975, foreign trade statistics of France did not register major changes in foreign mineral trade and retained all characteristics of foreign trade of an industrially developed country in Europe.

Metals and semimanufactured products remained the principal export items of France. Energy (crude oil and natural gas), ores and concentrates of metals, and metals were the major import items, accounting for approximately 58% of total import.

Arab countries, the U.S.S.R., and the Netherlands were the principal suppliers of hydrocarbons (liquid and gaseous), African countries, South American countries, and Canada were major suppliers of raw minerals. European Economic Community (EEC) countries supplied most of the metals and semimanufactures.

Tables 2 and 3 show trade trends, mostly down, for 1973 and 1974.

Table 2.—France: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite	55,242	114,365	West Germany 87,895; Switzerland 10,813.
Oxide and hydroxide [1]	r 408,457	390,939	Netherlands 203,713; Spain 85,185.
Metal including alloys:			
Scrap	21,687	20,567	Italy 10,469; West Germany 4,984; Belgium-Luxembourg 4,284.
Unwrought	183,633	179,819	Italy 46,104; Belgium-Luxembourg 35,731; West Germany 32,471.
Semimanufactures	135,805	141,663	West Germany 43,704; Italy 15,270; Belgium-Luxembourg 13,701.
Antimony metal including scrap	217	219	United Kingdom 99; West Germany 72.
Arsenic (anhydride)	9,543	9,311	United Kingdom 1,245; Australia 943.
Beryllium ---value, thousands [2]	$173	$16	NA.
Bismuth, all forms	229	158	Italy 122; United Kingdom 19.
Cadmium	132	150	Belgium-Luxembourg 92; West Germany 27.
Chromium:			
Chromite	207	581	West Germany 338.
Oxide and hydroxide	58	170	Belgium-Luxembourg 65.
Metal	440	677	West Germany 148; Belgium-Luxembourg 131; Sweden 101.
Cobalt	456	552	United States 94; Italy 63; Spain 60; West Germany 55.
Columbium (niobium), all forms value, thousands [2]	$3	$5	NA.
Copper:			
Matte	1,112	557	West Germany 335; Italy 83; Belgium-Luxembourg 74.
Metal and alloys:			
Scrap	75,171	74,412	Belgium-Luxembourg 29,546; West Germany 23,059; Italy 15,753.
Blister and other unrefined	6,835	7,770	Belgium-Luxembourg 6,310; Spain 1,242.
Refined	8,603	5,927	Italy 2,296; United Kingdom 1,992.
Semimanufactures	r 83,550	86,757	West Germany 28,044; Netherlands 11,920; United States 8,301.
Gallium [3] ---value, thousands [2]	$1,931	$3,952	Mainly to Switzerland.
Gold:			
Ashes and sweepings --kilograms	147	508	Switzerland 80.
Metal:			
For domestic use thousand troy ounces	487	104	Belgium-Luxembourg 77.
Temporary imports ---do	r 3,857	4,308	Switzerland 3,868.
Iron and steel:			
Iron ore ---thousand tons	19,454	19,833	Belgium-Luxembourg 16,174; West Germany 3,659.
Pyrite cinder ---do	109	29	Mainly to Belgium-Luxembourg.
Metal:			
Scrap ---do	2,788	3,724	Italy 2,855; Belgium-Luxembourg 461.
Pig iron including spiegeleisen [4] do	187	359	Italy 179; Belgium-Luxembourg 89; West Germany 67.
Ferroalloys ---do	575	654	West Germany 165; Italy 115; Belgium-Luxembourg 74.
Shot and powder ---do	28	36	West Germany 14; Italy 10.
Steel, primary forms, including coil ---do	914	1,115	Italy 474; Belgium-Luxembourg 188; West Germany 161.
Semimanufactures:			
Bars, rods, wire rods, sections ---do	3,009	3,644	West Germany 625; United States 576; Belgium-Luxembourg 421.
Plates, sheets, universals do	3,012	3,662	West Germany 786; United States 450; Italy 421.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Semimanufactures—Continued			
Hoop and strip thousand tons	486	462	West Germany 115; Italy 87; Belgium-Luxembourg 68.
Rails and accessories do	185	331	Italy 60; Turkey 47; Portugal 29.
Wire do	141	177	West Germany 42; United States 39; Belgium-Luxembourg 18.
Tubes, pipes, fittings do	1,056	1,156	Netherlands 112; Iraq 108.
Castings and forgings, rough do	49	80	United States 26; Belgium-Luxembourg 26; West Germany 11.
Lead:			
Ore	105	104	NA.
Oxides	15,938	12,252	Netherlands 3,715; Czechoslovakia 3,090; Italy 1,794.
Metal including alloys:			
Scrap	18,503	14,035	Italy 8,915; West Germany 4,125.
Unwrought	24,833	19,770	West Germany 6,736; Belgium-Luxembourg 4,058; Switzerland 3,781.
Semimanufactures	r 1,668	2,071	Italy 385; Belgium-Luxembourg 288; Spain 213.
Magnesium metal including alloys, all forms	4,278	2,910	West Germany 1,832; Netherlands 288.
Manganese:			
Ore	9,923	2,212	Italy 1,444.
Oxide	708	742	Ivory Coast 249.
Metal including alloys, all forms	6,558	7,117	West Germany 1,561; Italy 1,532; Sweden 1,068; United Kingdom 940; United States 798.
Mercury 76-pound flasks	145	145	NA.
Molybdenum:			
Ore	11	1	NA.
Oxide	117	35	Italy 15; Netherlands 11.
Metal including alloys, all forms	97	139	West Germany 63; Netherlands 56.
Nickel:			
Matte, speiss, etc	554	138	Chile 50; United Kingdom 30.
Oxides	606	553	Italy 234; Belgium-Luxembourg 61.
Metal including alloys:			
Scrap	r 2,509	3,405	Czechoslovakia 870; West Germany 827; United Kingdom 571.
Ingots	r 3,827	7,247	West Germany 3,028.
Semimanufactures including anodes	r 4,006	5,062	Spain 1,122; West Germany 829.
Platinum and platinum-group metal including alloys thousand troy ounces	r 150	182	Netherlands 30; West Germany 30; United Kingdom 20.
Selenium	8	4	NA.
Silver:			
Metal including alloys thousand troy ounces	21,594	25,188	Sweden 10,703; West Germany 7,789; Switzerland 2,799.
Ashes and sweepings do	94	2,872	Spain 1,864; West Germany 952.
Tantalum, all forms value, thousands [2]	r $143	$230	West Germany $112; United States $77.
Thorium oxide	44	39	United Kingdom 26; United States 5; West Germany 4.
Tin:			
Ore	r 420	209	Mainly to Spain.
Oxide	r 42	64	Mainly to West Germany.
Metal including alloys:			
Scrap	r 125	613	Netherlands 381; Belgium-Luxembourg 132.
Ingots	r 245	520	Netherlands 186; Belgium-Luxembourg 135.
Semimanufactures	r 224	1,336	Belgium-Luxembourg 249; Algeria 171; West Germany 153.
Titanium:			
Ore	r 277	372	Algeria 140.
Oxide	21,161	17,455	United States 2,839; West Germany 2,209.
Metal, all forms	364	786	Italy 249; West Germany 208; United States 88.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Tungsten:			
Ore	r 1,259	1,067	Mainly to West Germany.
Oxide	25	20	Do.
Metal, all forms	333	602	United States 313; West Germany 121.
Zinc:			
Ore	9,045	18,939	Mainly to Italy.
Matte	40	1,005	Belgium-Luxembourg 740; West Germany 97.
Oxide	20,363	--	
Metal including alloys:			
Scrap	r 2,295	1,276	Italy 640; Belgium-Luxembourg 296; West Germany 229.
Dust (blue powder)	r 4,045	5,889	Norway 2,560; United States 907.
Slab and ingot	r 40,034	29,425	United Kingdom 9,530; United States 3,451.
Semimanufactures	r 24,591	24,549	West Germany 10,835; Belgium-Luxembourg, 8,040.
Zirconium:			
Ore	563	3,779	Mainly to Italy.
Oxide	[3] 144	191	West Germany 59; Netherlands 45; Spain 40; Mexico 20.
Metal including nuclear grade	169	239	West Germany 66; Sweden 63; United States 52.
Other:			
Ore and concentrate	118	4,067	West Germany 2,733.
Ash and residue from nonferrous metals:			
Aluminum	7,106	8,499	Italy 5,901; West Germany 1,824.
Copper	12,339	10,682	Belgium-Luxembourg 7,425; West Germany 1,634.
Lead	8,596	9,051	Mainly to Netherlands.
Nickel	468	638	Belgium-Luxembourg 274; Netherlands 155.
Zinc	14,507	12,964	Belgium-Luxembourg 6,103; Netherlands 2,594; Sweden 2,261.
Other	25,088	24,050	Belgium-Luxembourg 14,968; Sweden 5,783.
Ashes, sweepings, and other residues of platinum, silver, and other precious metals	r 2,148	2,019	Mainly to Switzerland.
Slag and ash, n.e.s	37,219	45,240	Belgium-Luxembourg 31,239; West Germany 5,824.
Metal including alloys, all forms [5]	r 339	356	West Germany 154; Yugoslavia 83; Belgium-Luxembourg 45.
NONMETALS			
Abrasives, natural:			
Pumice, emery and other	689	2,011	Italy 1,124.
Dust and powder of precious and semiprecious stones value, thousands [2]	$463	$673	Spain $372; Switzerland $193.
Grinding and polishing wheels	r 3,608	4,163	West Germany 687; Italy 563; Belgium-Luxembourg 560; Spain 428.
Asbestos, crude	2,694	317	NA.
Barite including witherite	16,649	25,217	Gabon, 5,567; Tunisia 5,129; Italy 4,080.
Borates, natural	2,852	1,806	Italy 904; Switzerland 389.
Cement thousand tons	2,429	2,218	Ivory Coast 369; United States 325; Algeria 313; West Germany 265.
Chalk	454,952	478,215	West Germany 203,492; Switzerland 26,483; Algeria 13,954.
Clays and clay products (including all refractory brick):			
Crude:			
Kaolin	91,781	135,397	West Germany 65,668; Italy 30,383.
Bentonite	1,937	3,564	Belgium-Luxembourg 1,003; West Germany 544; Tunisia 362.
Refractory	403	3,160	West Germany 2,709.
Other	507,362	604,757	Italy 337,802; West Germany 107,437; Belgium-Luxembourg 50,753.
Products: Refractory (including nonclay brick)	r 473,105	482,191	West Germany 142,130; Belgium-Luxembourg 137,869.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Corundum:			
Natural including emery (included in abrasives above)	412	433	Algeria 244.
Artificial	19,465	23,940	Italy 4,803; West Germany 3,687; Belgium-Luxembourg 3,582; Austria 2,672.
Cryolite and chiolite, natural	24	--	
Diamond:			
Industrial, excluding powder value, thousands [2]	r $1,368	$837	Belgium-Luxembourg $403.
Gem, unset do	r $13,823	$18,143	Switzerland $8,649; Netherlands $3,187; United States $2,462.
Diatomite	16,297	19,428	West Germany 9,261; Belgium-Luxembourg 2,342.
Feldspar	43,104	43,153	Belgium-Luxembourg 17,800; Spain 12,841; West Germany 5,359.
Fertilizer materials:			
Crude:			
Nitrogenous (natural sodium nitrates)	5	515	Morocco 269.
Phosphate rock	2,406	3,972	Ecuador 1,400; Liberia 495.
Potassic salts	32,566	24,148	Mainly to Belgium-Luxembourg.
Organic	r 24,195	26,363	Switzerland 13,289; Spain 3,048; Belgium-Luxembourg 2,756.
Manufactured:			
Nitrogenous thousand tons	540	559	Egypt 99; Belgium-Luxembourg 91; Morocco 82; West Germany 68.
Phosphatic:			
Basic slag do	239	286	Switzerland 122; Austria 109; Italy 42.
Other do	68	124	Belgium-Luxembourg 30; Brazil 13; Kenya 11; United Kingdom 10.
Potassic do	700	789	Belgium-Luxembourg 312; Italy 110.
Ammonia, anhydrous do	176	207	West Germany 105; Spain 40.
Flint (pebbles)	820,552	120,512	United Kingdom 29,181; West Germany 28,025; Belgium-Luxembourg 14,404.
Fluorspar	122,828	146,743	West Germany 98,392; Italy 17,003.
Graphite	1,606	1,079	Spain 289; West Germany 134.
Gypsum and anhydrite, including plasters thousand tons	1,243	1,254	Belgium-Luxembourg 484; Netherlands 169; Denmark 162; Norway 148.
Iodine	11	14	NA.
Lime	r 371,957	398,602	West Germany 194,198; Belgium-Luxembourg 158,360.
Magnesite, including calcined	719	664	NA.
Mica	1,861	2,967	United Kingdom 1,295; West Germany 815; Belgium-Luxembourg 293.
Pigments, mineral, including iron oxide	2,323	2,143	NA.
Pozzolan, santorin, etc	20,170	29,304	Switzerland 14,975; Ivory Coast 14,038.
Precious and semiprecious stones, except diamond [6] value, thousands [2]	r $19,851	$20,768	Mainly to Switzerland.
Pyrite, gross weight	1,626	36	NA.
Salt	r 158,753	236,916	West Germany 82,050; Spain 79,324; Belgium-Luxembourg 22,342.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	503,778	566,828	Australia 98,680; Yugoslavia 75,148; Brazil 70,495; Guinea 67,841.
Caustic potash and peroxides of potassium and sodium	12,010	19,141	Netherlands 5,881; Sweden 1,530.
Stone, sand and gravel: [7]			
Building stone:			
Crude and partly worked, n.e.s.	99,792	113,336	Belgium-Luxembourg 68,416; West Germany 20,729; Switzerland 11,607.
Worked:			
Slate, including crude	39,057	48,486	Belgium-Luxembourg 22,962; Netherlands 19,422.
Not specified	13,891	14,429	Belgium-Luxembourg 7,025; West Germany 4,112.
Dolomite, chiefly refractory grade	88,937	90,156	Belgium-Luxembourg 45,460; Liberia 12,300; West Germany 10,031.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Stone, sand and gravel [7]—Continued			
Gravel, and crushed stone thousand tons	r 12,926	12,676	West Germany 9,365; Switzerland 1,838.
Limestone (except dimension)	247,143	236,906	West Germany 129,987; Belgium-Luxembourg 79,153.
Quartz and quartzite	5,374	5,299	Netherlands 3,459.
Sand excluding metal bearing thousand tons	4,275	3,666	West Germany 2,094; Switzerland 1,026.
Sulfur, elemental do	870	871	United Kingdom 445; Spain 75; Tunisia 70.
Talc and steatite	68,688	76,432	West Germany 18,531; United Kingdom 13,315; United States 8,892.
Other nonmetals, n.e.s.:			
Crude	269,971	277,353	Switzerland 231,293.
Slag, dross and similar waste not metal bearing, from iron and steel manufacture thousand tons	1,340	1,161	West Germany 716; Belgium-Luxembourg 227.
Oxides and hydroxides of magnesium, strontium, barium	5,871	8,514	U.S.S.R. 1,895; West Germany 1,421.
Fluorine	21	1	NA.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	r 7,078	10,465	Mainly to United Kingdom.
Carbon black	43,732	40,496	Italy 8,302; Spain 6,486; West Germany 6,249; Belgium-Luxembourg 5,033.
Coal and briquets:			
Bituminous	951,554	638,226	West Germany 373,480; Belgium-Luxembourg 122,861.
Briquets of bituminous coal	r 80,107	77,214	United Kingdom 55,381; West Germany 9,485.
Lignite	29,112	26,247	Mainly to Spain.
Coke thousand tons	919	1,013	Belgium-Luxembourg 445; West Germany 183.
Gas, natural million cubic feet	r 2,962	4,485	Switzerland 2,531; Belgium-Luxembourg 1,715.
Hydrogen, helium, rare gases	r 814	798	Switzerland 447.
Peat, including briquets	r 4,636	3,092	NA.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	r 25,271	21,046	United Kingdom 4,747; Switzerland 4,668; West Germany 4,478.
Kerosine and jet fuel do	5,692	5,532	Switzerland 3,172; West Germany 680.
Distillate fuel oil do	r 32,861	28,438	Switzerland 12,637; West Germany 9,295.
Residual fuel oil do	r 24,761	15,271	West Germany 4,562; Switzerland 2,140; Belgium-Luxembourg 1,946.
Lubricants do	r 2,776	3,267	Belgium-Luxembourg 654; United Kingdom 400; Netherlands 322.
Other:			
Liquefied petroleum gas do	r 6,352	6,622	Spain 3,703; Portugal 878.
Bitumen, petroleum coke, other residues do	2,375	3,005	West Germany 1,573; Switzerland 683.
Chemical derivatives of coal, petroleum, or gas	r 103,912	221,021	West Germany 82,974; United Kingdom 68,008; Belgium-Luxembourg 15,150.

r Revised. NA Not available.
[1] Excludes artificial corundum.
[2] Based on exchange rate of 4.4540 francs per U.S. dollar in 1973 and 4.8099 francs per U.S. dollar in 1974.
[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 and mercury.
[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	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite	587,765	1,012,251	Guinea 408,489; Australia 368,432; Greece 129,933.
Oxide and hydroxide [1]	20,583	14,162	West Germany 7,025; Netherlands 2,643; United States 1,912.
Metal including alloys:			
Scrap	30,600	27,203	Belgium-Luxembourg 9,070; West Germany 6,741; Netherlands 3,281.
Unwrought	r 229,744	262,882	Netherlands 66,751; West Germany 35,257; Greece 32,219.
Semimanufactures	136,112	132,703	West Germany 56,906; Belgium-Luxembourg 34,219.
Antimony:			
Ore and concentrate	6,286	8,104	Bolivia 2,652; Thailand 1,900; Republic of South Africa 1,487.
Metal, all forms	2,269	2,110	Belgium-Luxembourg 956; People's Republic of China 415.
Arsenic, anhydride and acid	5	20	NA.
Beryllium, metal, all forms value, thousands [2]	$391	$711	Mainly from United States.
Bismuth	1,146	1,259	Bolivia 447; Peru 324; Japan 172.
Cadmium	613	937	Japan 402; Belgium-Luxembourg 309.
Chromium:			
Ore	r 330,803	365,300	Malagasy Republic 107,427; Turkey 81,756; U.S.S.R. 69,353.
Oxide and hydroxide	2,937	2,706	West Germany 938; U.S.S.R. 531; United Kingdom 352.
Metal, all forms	83	88	West Germany 39; United States 13; Japan 10.
Cobalt:			
Ore	8,499	8,625	Mainly from Morocco.
Oxide and hydroxide	253	296	Mainly from Belgium-Luxembourg.
Metal, all forms	568	855	Zaire 432; United States 172; Norway 90.
Columbium:			
Ore (including tantalum ore) [3]	814	1,081	Canada 830; Gabon 148.
Metal, all forms value, thousands [2]	$122	$116	United States $47.
Copper:			
Ore and concentrate	r 2,959	501	NA.
Matte	1,970	2,481	United Kingdom 1,221; West Germany 679; Belgium-Luxembourg 274.
Metal including alloys:			
Scrap	r 13,209	17,817	Belgium-Luxembourg 4,875; Netherlands 3,312; West Germany 2,075.
Blister and other unrefined	18,296	42,001	Zaire 10,550; Yugoslavia 9,958; Belgium-Luxembourg 7,153; Chile 6,383.
Refined	381,374	377,458	Belgium-Luxembourg 111,682; Zambia 73,441; Chile 32,981.
Semimanufactures	r 79,509	97,240	Belgium-Luxembourg 37,101; West Germany 34,799; Italy 10,799.
Germanium, gallium, etc value, thousands [2]	$502	$988	Belgium-Luxembourg $450; West Germany $140; Japan $109.
Gold:			
Ash and sweepings ----kilograms	4,376	1,213	Netherlands 590; Switzerland 576.
Metals:			
For domestic use thousand troy ounces	1,469	360	Netherlands 174; United States 134.
Temporary imports -----do	4,130	4,726	Switzerland 1,933; Lebanon 827; Laos 643; United Kingdom 640.
Iron and steel:			
Ore and concentrate, except roasted pyrite ----------thousand tons	11,530	15,822	Brazil 4,090; Sweden 2,664; Mauritania 2,452.
Roasted pyrite	114,005	131,827	Italy 75,202; West Germany 44,055.
Metal:			
Scrap	436,566	328,123	Belgium-Luxembourg 167,130; West Germany 81,893.
Pig iron, spiegeleisen, other [4] thousand tons	411	332	West Germany 264; Canada 18.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Ferroalloys ---thousand tons--	157	197	New Caledonia 112; West Germany 26; Belgium-Luxembourg 22.
Steel, primary forms ---do----	1,911	2,027	Belgium-Luxembourg 1,305; West Germany 566; Spain 63.
Semimanufactures:			
Bar, rods, sections [5] -do----	2,519	2,332	Belgium-Luxembourg 1,063; West Germany 956; Italy 117.
Plates, sheets, universals do----	r 3,228	3,153	Belgium-Luxembourg 1,591; West Germany 941; Netherlands 124.
Hoop and strip -----do----	418	431	Belgium-Luxembourg 271; West Germany 130; Italy 19.
Rails and accessories do----	88	75	United Kingdom 43; Belgium-Luxembourg 20; West Germany 10.
Wire ---------------do----	156	154	Belgium-Luxembourg 63; West Germany 61; Netherlands 12.
Tubes, pipes, fittings do----	471	443	West Germany 193; Belgium-Luxembourg 71; Italy 57.
Castings and forgings, rough ----------------	13,407	31,988	West Germany 14,232; Switzerland 6,463; Belgium-Luxembourg 6,334.
Lead:			
Ore and concentrate --------------	150,422	165,544	Morocco 42,716; Ireland 28,774; Canada 26,948.
Oxide ----------------------------	3,207	2,982	Belgium-Luxembourg 958; Mexico 772; East Germany 525.
Metal including alloys:			
Scrap ------------------------	r 12,618	21,755	Netherlands 10,167; Belgium-Luxembourg 7,231.
Unwrought ------------------	38,815	43,940	Belgium-Luxembourg 15,350; United Kingdom 12,444; West Germany 10,279.
Semimanufactures ------------	949	1,192	West Germany 762; Belgium-Luxembourg 294.
Magnesium including alloys			
Scrap ----------------------------	344	329	Mainly from Italy.
Unwrought ----------------------	1,612	2,850	Norway 849; United States 758; U.S.S.R. 579.
Semimanufactures ---------------	93	139	United States 62; West Germany 25.
Manganese:			
Ore and concentrate thousand tons--	1,432	1,428	Gabon 719; Australia 54; Morocco 34.
Oxide ---------------------------	5,595	4,518	Japan 1,590; West Germany 1,374; Belgium-Luxembourg 892.
Metal, all forms ----------------	735	489	Mainly from Republic of South Africa.
Mercury, all forms ---76-pound flasks--	11,458	9,747	Italy 2,901; Spain 2,205; U.S.S.R. 2,031; People's Republic of China 1,131.
Molybdenum:			
Ore and concentrate --------------	7,544	8,836	Canada 4,878; United States 1,722; Netherlands 1,502.
Oxide ---------------------------	153	134	Mainly from Netherlands.
Metal, all forms ----------------	182	174	West Germany 59; Austria 37; United States 22.
Nickel:			
Matte ---------------------------	r 15,175	13,377	New Caledonia 11,765; Canada 1,549.
Oxide and hydroxide --------------	r 90	121	Canada 75; United Kingdom 36.
Metal including alloys:			
Scrap ------------------------	r 2,292	1,544	Spain 444; United Kingdom 290; Belgium-Luxembourg 289.
Unwrought ------------------	10,499	15,307	United Kingdom 3,843; Canada 3,218; U.S.S.R. 3,210.
Semimanufactures (including anodes) -------------------	4,959	5,426	West Germany 2,453; United Kingdom 1,064; United States 973.
Platinum and platinum-group:			
Ashes and sweepings --kilograms--	1,619	1,257	Mainly from Netherlands.
Metals --------------troy ounces--	425,997	350,668	United Kingdom 95,295; U.S.S.R. 73,528; Republic of South Africa 49,512.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Selenium	83	107	Japan 31; United States 24; Sweden 14.
Silver:			
Ashes and sweepings ..kilograms..	11,723	18,084	Netherlands 7,619; Spain 4,731; United Kingdom 4,361.
Metal, all forms thousand troy ounces..	r 48,739	38,056	United Kingdom 10,529; West Germany 6,436; Dubai 4,842.
Tantalum, all forms	26	37	United States 20; West Germany 11.
Thorium:			
Ore (Monazite)	3,494	5,320	Australia 3,381; Brazil 862; Malaysia 756.
Metal ....value, thousands [2]..	(6)	(6)	NA.
Tin:			
Oxide	r 179	209	Belgium-Luxembourg 107; West Germany 101.
Metal including alloys:			
Scrap	185	149	Switzerland 54; Italy 53; Belgium-Luxembourg 34.
Ingots	12,242	12,019	Malaysia 5,538; Indonesia 1,624; United Kingdom 1,436.
Semimanufactures	r 186	188	West Germany 108; Netherlands 31.
Titanium:			
Ore	r 142,385	176,359	Mainly from Australia.
Oxide	35,817	31,857	West Germany 17,302; Belgium-Luxembourg 5,387; Netherlands 3,456.
Metal, all forms	1,364	1,607	U.S.S.R. 532; United Kingdom 455; United States 221.
Tungsten:			
Ore	r 2,498	2,774	Republic of Korea 587; People's Republic of China 446; Brazil 389; Australia 279.
Trioxide	31	72	Mainly from West Germany.
Metal, all forms	161	134	West Germany 64; Netherlands 21; United States 17.
Uranium:			
Ore	r 1,461	1,647	Mainly from Niger.
Metal including alloys .kilograms..	1,214,155	644,590	United States 258,564; Spain 179,298; West Germany 103,999.
Zinc:			
Ore and concentrate	r 465,178	540,499	Canada 127,872; Peru 127,171; Ireland 50,350.
Oxide	4,254	3,064	West Germany 897; Belgium-Luxembourg 862.
Metal including alloys:			
Scrap	r 22,816	23,885	Netherlands 9,061; Belgium-Luxembourg 8,258; United Kingdom 2,421.
Blue powder	4,617	4,844	Mainly from Belgium-Luxembourg.
Unwrought	r 66,666	82,191	Belgium-Luxembourg 31,045; Netherlands 12,428; West Germany 8,591.
Semimanufactures	r 4,195	2,849	West Germany 1,864; Belgium-Luxembourg 491.
Zirconium:			
Ore	39,708	42,114	Mainly from Australia.
Oxide [7]	480	590	United Kingdom 296; United States 122; U.S.S.R. 80.
Metal	134	62	NA.
Other:			
Ashes and concentrates	5,767	12,520	Guiana 5,920; Australia 1,846; People's Republic of China 1,586.
Ashes and residues containing nonferrous metals:			
Aluminum	8,926	11,250	Italy 2,479; Netherlands 2,485; Belgium-Luxembourg 2,122.
Copper	135	683	Belgium-Luxembourg 445; West Germany 100.
Lead	1,093	14,688	Italy 6,689; United Kingdom 5,877; West Germany 1,064.
Nickel	75	129	Mainly from West Germany.
Zinc	72,106	32,087	West Germany 13,171; Belgium-Luxembourg 5,747.
Other	r 9,600	14,567	Canada 9,932; West Germany 3,315.
Metal including alloys, all forms	69	72	NA.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS			
Abrasives:			
Emery, natural corundum, other	38,895	47,337	Mainly from Turkey.
Pumice	7,198	6,705	Italy 3,252; West Germany 1,012; Netherlands 721.
Dust and powder of precious and semiprecious stones value, thousands [2]	$8,081	$9,133	United States $4,310; Republic of South Africa $1,514.
Grinding and polishing wheels	r 7,218	6,831	Italy 1,709; West Germany 1,595; Belgium-Luxembourg 1,592.
Asbestos	158,549	177,707	Canada 84,957; U.S.S.R. 55,371; Republic of South Africa 18,567.
Barite and witherite	54,430	77,584	People's Republic of China 46,773; West Germany 24,225.
Boron materials:			
Crude natural borates	127,815	182,825	Turkey 122,700; United States 54,993.
Oxide and acid	1,966	2,196	Italy 1,348; United States 321; Turkey 300.
Bromine	260	292	Israel 216; United Kingdom 44.
Cement	183,082	32,407	West Germany 14,285; Spain 4,927; Belgium-Luxembourg 4,300.
Chalk	25,129	21,177	West Germany 12,324; Belgium-Luxembourg 8,696.
Clays and clay products:			
Crude:			
Kaolin including calcined	348,505	353,893	United Kingdom 266,228; West Germany 23,872.
Bentonite	72,907	117,099	Italy 37,040; Greece 35,977; West Germany 28,142.
Clay and construction materials (bricks, etc.)	855,573	885,064	West Germany 318,298; Italy 308,099; Belgium-Luxembourg 90,237.
Cryolite and chiolite, natural	867	1,054	Mainly from Denmark.
Diamond:			
Industrial, except dust value, thousands [2]	r $5,854	$7,022	Belgium-Luxembourg $2,797; Ireland $2,250; United Kingdom $939.
Gem unset do	r $63,260	$83,435	Belgium-Luxembourg $31,416; Switzerland $17,134; Israel $11,209.
Diatomite	7,376	6,116	United States 2,343; West Germany 1,653; Denmark 775; Algeria 619.
Feldspar	7,374	15,211	West Germany 6,972; Spain 4,256; Portugal 2,797.
Fertilizer materials:			
Crude:			
Nitrogenous (natural sodium nitrate)	11,378	18,197	Mainly from Chile.
Phosphate rock thousand tons	4,919	5,861	Morocco 2,413; Togo 1,480; Senegal 791.
Manufactured:			
Nitrogenous	r 784,880	587,133	Belgium-Luxembourg 303,732; Netherlands 135,574; West Germany 78,007.
Potassic	r 431,836	377,686	Israel 138,451; Belgium-Luxembourg 122,355; U.S.S.R. 61,916.
Phosphatic:			
Basic slag	761,665	675,400	Mainly from Belgium-Luxembourg.
Other	453,932	450,976	Belgium-Luxembourg 128,030; Netherlands 104,762; Senegal 92,674.
Ammonia	365,490	343,630	Belgium-Luxembourg 149,672; Netherlands 62,222; U.S.S.R. 33,138.
Flint (pebbles)	935,527	1,012,739	Mainly from United Kingdom.
Fluorspar	6,071	4,343	People's Republic of China 1,391; United Kingdom 1,028; Italy 922; West Germany 896.
Graphite	8,334	8,859	People's Republic of China 2,536; Malagasy Republic 2,157; Italy 1,343.
Gypsum and plaster	7,640	8,289	West Germany 5,708; Italy 1,439.
Iodine, crude	669	1,200	Mainly from Japan.
Lime	180,197	150,404	Belgium-Luxembourg 104,407; West Germany 40,804.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Lithium and strontium minerals	3,428	5,810	Republic of South Africa 2,617; Mozambique 970; United Kingdom 900; Netherlands 622.
Magnesite including calcined	63,010	68,089	Austria 15,546; Greece 12,979; United Kingdom 8,316.
Mica	5,120	7,598	India 5,006; Republic of South Africa 886.
Pigments:			
Earth pigments, including iron oxides	1,386	1,091	West Germany 240; Austria 195.
Earth, other (pozzolanic), santorin, etc	1,995	3,806	NA.
Precious and semiprecious stones [8] value, thousands [2]	r $34,775	$43,226	Switzerland $14,521; India $13,738.
Pyrite	156,798	88,959	Cyprus 47,853; U.S.S.R. 26,540.
Salt	r 195,180	162,089	Belgium-Luxembourg 92,584; Netherlands 35,610; West Germany 15,505.
Sodium and potassium salts, n.e.s.:			
Caustic soda	84,178	98,722	Belgium-Luxembourg 48,360; West Germany 22,081.
Caustic potash and peroxides of potassium and sodium	997	498	West Germany 318; Sweden 69.
Stone, sand and gravel: [9]			
Dimension stone:			
Crude and partly worked:			
Slate	4,493	5,509	United Kingdom 3,407; Italy 678.
Other	308,619	258,540	Italy 80,229; Republic of South Africa 72,581; West Germany 38,792; Norway 29,440.
Worked:			
Slate	59,123	77,105	Mainly from Spain.
Other	134,820	133,242	Italy 97,921; West Germany 24,720.
Dolomite, chiefly refractory grade	307,370	391,205	Belgium-Luxembourg 294,980; West Germany 88,930.
Gravel and crushed stone thousand tons	r 4,797	4,612	Mainly from Belgium-Luxembourg.
Limestone	260,820	249,356	Do.
Quartz and quartzite	26,655	28,654	West Germany 14,667; Italy 11,234.
Sand, excluding metal bearing thousand tons	1,705	1,757	Belgium-Luxembourg 879; United Kingdom 424; Netherlands 360.
Sulfur, elemental, all grades	r 565,031	798,070	Poland 301,071; United States 222,299; Canada 163,678.
Talc and steatite	7,080	8,521	Italy 2,944; Belgium-Luxembourg 2,528; Norway 1,469.
Other nonmetals, n.e.s	r 993,011	840,763	Switzerland 578,408; West Germany 55,297; Belgium-Luxembourg 43,985.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	r 2,417	2,662	Mainly from United States.
Carbon black	66,306	66,518	Netherlands 37,160; West Germany 12,796; United States 9,790.
Coal and briquets:			
Coal thousand tons	12,499	16,259	West Germany 6,588; Poland 3,276; United States 2,642; U.S.S.R. 1,566.
Coal briquets do	109	81	West Germany 47; Belgium-Luxembourg 24; United Kingdom 10.
Lignite and lignite briquets do	244	250	Mainly from West Germany.
Coke do	3,498	4,603	West Germany 3,906; Netherlands 383; Belgium-Luxembourg 153.
Gas, natural million cubic feet	r 248,070	323,430	Netherlands 279,961; Algeria 43,456.
Hydrogen and rare gases	17,785	22,450	West Germany 12,458; Belgium-Luxembourg 6,492; Netherlands 3,127.
Peat including briquets thousand tons	74	76	West Germany 42; Netherlands 18; U.S.S.R. 10.
Petroleum:			
Crude thousand 42-gallon barrels	r 994,753	949,869	Saudi Arabia 305,787; Iraq 119,057; United Arab Emirates 90,762.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS —Continued			
Petroleum—Continued			
Refinery products:			
Gasoline thousand 42-gallon barrels	15,309	13,124	West Germany 5,089; Italy 3,817; Spain 1,019.
Kerosine do	602	893	Italy 379; United Kingdom 177; Belgium-Luxembourg 90.
Distillate fuel oil do	21,030	14,361	Italy 4,383; U.S.S.R. 3,597; Romania 2,055.
Residual fuel oil do	r 11,568	16,617	Netherlands 3,683; West Germany 2,204; Italy 2,053; U.S.S.R. 1,926.
Lubricants do	587	813	United Kingdom 174; Netherlands 93; West Germany 83.
Other:			
Liquefied petroleum gas do	2,911	2,339	U.S.S.R. 1,095; Venezuela 177; Sweden 165.
Vaseline, waxes, petroleum coke, bitumen, mixtures of bitumen, etc do	3,315	2,897	United States 2,142; West Germany 442.
Mineral tar and crude chemicals derived from coal, petroleum, or gas	r 265,444	292,859	United States 106,404; Belgium-Luxembourg 51,319; West Germany 37,896.

r Revised. NA Not available.
[1] Excludes artificial corundum.
[2] Based on exchange rate of 4.4540 francs per U.S. dollar in 1973 and 4.8099 francs per U.S. dollar in 1974.
[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

Aluminum.—The aluminum industry of France had a mixed year. Bauxite output declined; output of alumina and aluminum remained at about the same levels as in 1974. Because of lower consumption of aluminum metal, imports were cut by 30% in 1975.

During 1975 the limited proved reserves of bauxite continued to decline in France and a 3-year downtrend in output also continued, from 3.3 million tons in 1973 to 2.6 million tons in 1975. The Bureau de Recherches Géologiques et Minières (BRGM) conducted a reevaluation of French aluminum resources, and preliminary results indicated justification for new bauxite exploration programs in 1977.

Aluminium-Péchiney (part of the Péchiney Ugine Kuhlman S.A. (PUK) group) accounted for about 60% of French bauxite production; three other producers accounted for the remainder. Bauxite mines were located in the Départements[2] du Var, Hérault, Bouches-du-Rhône, and Ariège. The following tabulation shows the various départements' share of total national output in 1975:

	Percent of total
Var	76
Hérault	16
Bouches-du-Rhône	7
Ariège	1
Total	100

Domestic bauxite output was adequate to meet about 60% of indigenous demand in 1975; the remainder was supplied by imports. Australia and Guinea provided 83% of total French bauxite imports. Exports of bauxite were insignificant when compared with domestic output.

During 1975, alumina (about 1.2 million tons) was produced at three plants (Gardanne, La Barasse, and Salindres) owned

[2] Départements are basic administrative units into which the whole French territory is divided.

by PUK. Their share of the total country output was as follows:

Plant	Département	Percent of total
Gardanne	Bouches-du-Rhône	60
La Barasse	Gard	26
Salindres	do	14

Domestic output of alumina was more than adequate to meet demand, and about 27% of the production was exported. Principal purchasers were the Netherlands (61% of the total) and Spain (31% of the total). Imports were negligible when compared with exports.

PUK continued construction of a pilot plant for producing alumina from alunite using the H+ process. Startup was scheduled for 1976.

In 1975, France had 10 electrolytic aluminum plants, owned by Aluminium-Péchiney, which were located in areas with abundant cheap electric power. Output of 383,000 tons reflected plant utilization of 93%. The following tabulation shows the percent contribution of the various plants to total output during 1975:

Départements	Plant	Percent of total
Pyrénées Atlantiques	Nogueres	27
Hautes-Pyrénées	Lannemazan	14
Ariège	Auzatz	8
	Sabart	6
Savoie	La Praz	1
	Sa Saussaz	3
	Saint-Jean-de-Maurienne	16
	Venthon	7
Isère	Riouperoux	7
Haute Alpes	L'Argentiere	11

Domestic output provided 67% of the country's supply and 96% of its consumption. The Netherlands (27%), West Germany (20%), and Greece (12%) were the principal suppliers of imported aluminum. The People's Republic of China was the major importer of aluminum and aluminum alloys produced in France, receiving about 29% of total French exports of these two commodities.

Copper.—Without mine and smelter production, France was a refiner of imported blister and scrap. Three refining plants were in operation during 1975. The major electrolytic plant, located at Palais, Haute Vienne, and operated by Compagnie d'Electrolyse du Palais, produced about 39,000 tons of electrolytic copper. Feed for this plant was half imported anodes and half scrap. Another electrolytic plant and one fire refinery were modest in size compared with the Palais plant. Aggregate output of both plants was only 650 tons in 1975. The upward trend of production since 1970 reversed itself for the first time in 1975. Imported copper anodes remained the principal source of French supply in 1975 and imports, like production, declined by 11% when compared with those of 1974. The Federal Republic of Germany and Belgium were the principal suppliers.

Iron and Steel.—The French iron and steel industry had a poor year in 1975. Production in all categories was down, as were domestic consumption, trade, and investment. The worldwide economic situation was the major cause. Commissioning of two ministeel plants and expanding an existing plant were the major events in the industry.

Iron ore was produced from three major basins, Est, Ouest, and Pyrénées. The Est basin, located in Lorraine, accounted for 95% of the country's iron ore output in 1975. After 2 years at the same level of production, iron ore output started to decline in 1975 and stocks increased. A total of 9,700 persons were employed in French iron mines at yearend 1975.

Two ministeel plants came onstream during 1975. Société des Aciéries des Montereau commissioned, at Montereau, a plant with a 60-ton electric furnace, facilities for continuous castings of billets, and a rolling mill for bars and wires. Sud-Acier at Toulon starting producing reinforcing rods for concrete in a facility with a 60-ton electric furnace and a rolling mill.

A new addition to the Saint Saulve steel plant, operated by Société des Aciéries d'Anzin, started production. One 60-ton electric furnace and installations for the continuous casting of tube rounds for rolling pipe of 120- to 210-millimeter diameters were the major components of the new addition.

No general layoffs took place in the French iron and steel industry during 1975. Total employment declined by 1.0%, and at yearend was 155,550. The industry met the economic situation by shortening the work week. However, the number of hours worked to produce a ton of steel increased from 10 hours and 49 minutes in 1974 to 12 hours and 6 minutes in 1975. During 1975, underemployed workers were utilized in maintenance operations. In times of high production, maintenance was often contracted out.

Principal steel producers, their production in million tons, and major plants were:

Union Sidérurgique du Nord de la France (USINOR), (7.9), Dunkerque, Longwy, Thionville, Denain, and Valenciennes.

Sacilor Aciéries et Laminoirs de Lorraine S.A. (SACILOR), (6.0), Boussange near Grandrange; Usinede l'Orne-Amont, Homecourt; Rombas, Moselle; and Hagondange, Moselle.

Société Lorraine de Laminage Continu (SOLLAC), (2.0), Hayange, Knutange, Sermange, Ebange, and Florange, all in Moselle.

Société Lorrain et Méridionale a Laminage Continu (SOLMER), (1.6), Fos-sur-Mer near Marseilles. CREUSOT-LOIRE, Enterprise S.A., (1.3), Le Creusot, St. Ètienne Leffrincroucke near Dunkerque, Imphy, and Firkny (Loire).

The percent of total steel production by various processes for selected years were as follows:

Process	1960	1970	1974	1975
Thomas	60.5	41.1	19.2	15.2
Pure oxygen	.6	29.0	58.4	63.4
Martin	29.7	18.6	10.8	7.1
Electric	8.6	11.0	11.5	14.2
Other	.6	.3	.1	.1
Total	100.0	100.0	100.0	100.0

Data indicate a continuing change from the Thomas and Martin processes to pure oxygen and electric furnaces. While in 1960 the Thomas and Martin processes accounted for 90.2% of the total steel output, in 1975 they provided only 22.3%.

Lead.—Most of the mine production of lead came from two mines, Largenterie and Malines (Département de Gard), in southern France, operated by Société Minière & Metallurgique de Peñarroya S.A. France remained dependent (81%) on imports of lead concentrate to meet its smelter demand. Ireland, the United States, and Greenland were the principal suppliers. During 1975, both production and imports of ore declined, continuing the downtrend started in 1974.

About 27% of lead metal consumption was met by imports during 1975. Both production and imports declined, a trend that started during 1974. Peñarroya operated the only primary lead smelter in France located near Noyelle Godault. The plant, a 130,000-ton-per-year Imperial smelter and refinery, produced about 19% less lead in 1975 than in 1974 because of lower demand. Secondary lead was produced in Peñarroya's plants at Saint-Denis, Lyon, and Escaudoevres and in a plant operated by Société Chimique des Mureaux, located in the municipality of Mureaux.

Preliminary figures on French trade in lead and alloys showed imports of 58,000 tons and exports of 21,000 tons in 1975. Countries belonging to the EEC were both the major suppliers and purchasers. In 1975 consumption was down following the trend begun in 1973. Net imports accounted for about 20% of the country's consumption of lead metal.

Nickel.—Based on imported nickel matte from New Caledonia, Société le Nickel (SLN) remained the sole nickel producer in France in 1975. SLN started construction of a new nickel plant at Havre to replace the existing one. Quality requirements for nickel that prevailed on the nickel market could not be met by the old plant; consequently, its replacement became an economic necessity. France consumed about 23,000 tons of nickel including oxides. About 10,857 tons of contained nickel was produced in 1975, about 2,155 tons more than in 1974.

Tin.—In October 1975, mine production of tin stopped with the closing of the mine Saint Renan (Finistère) mine because economic reserves were exhausted. Tin metal activities were limited to recovery of secondary tin. Imports of metal were the primary sources of supply during 1975.

Tungsten.—During 1975, France remained the principal tungsten producer among the EEC countries. Two mines were in operation; the Salau mine, Ariège, operated by the Société Minière d'Anglade, was the largest producer. Production, imports, and consumption of tungsten continued the downtrend begun in 1973.

Zinc.—A new zinc mine and a new zinc electrolytic plant came onstream during 1975. The new mine, Saint-Salvy, was operated by Peñarroya. Data on ore quality, output capacity, and other factors important for evaluation of the mine were not made public. In addition, two other Peñarroya mines, Largentier and Malines, (Département de Gard) were in operation. Domestic production, however, was modest compared with ore and concentrate consumption. Consequently, to meet demand France was dependent on imports for 94% of zinc ore and concentrate requirements. Peru, Canada, Ireland, Sweden, and Morocco were the principal suppliers of zinc raw materials. Smelter production of zinc in France peaked out in 1974, and during 1975 was 35% lower.

Compagnie Royal Austurienne des Mines switched to electrolytic zinc production at its plant at Auby, Nord. The new 80,000-ton-per-year facility had the same capacity as the conventional plant that was closed. An equivalent of about U.S.$40 million was invested in the new plant and 450 persons were employed. The installation was designed to operate more cleanly by eliminating emissions associated with ore roasting.

In addition, two plants located at Viviez (Aveyron) and Creil (Oise), were operated by Société Vieille Montagne; Peñarroya operated one plant at Noyelles-Godault (Pas-de-Calais).

After a steady increase since the beginning of 1970, zinc consumption decreased in 1975. Domestic output of zinc metal was equal to 81% of consumption.

NONMETALS

Barite.—Trial production by Société des Mines de Garrot Chaillac (SMGC) started at the Rossignol deposit. The open pit mine and beneficiation plant are located about 50 kilometers southwest of Chateauroux in Indre Département. The deposit was estimated to contain about 8 million tons of crude barite ore, of which 4 million tons was considered recoverable. The deposit overlies gneissic rocks of the Massif Central, and has an average barite thickness of 12 meters. Production was scheduled at a rate of 100,000 tons per year of concentrate. The beneficiation plant incorporated gravity and flotation sections.

In addition, barite was produced from several other deposits in France. Most were located in the southern part of the country. About 100,000 tons was produced during 1975.

Borax.—Expansion of the boric acid plant at Condé-Kerque continued during 1975. When completed in 1976 the plant was to produce 50,000 tons per year. Borax Français, a wholly-owned subsidiary of Rio Tinto Zinc Borax, operated the plant and invested in the expansion.

Cement.—About 64 cement plants were in operation in 1975, with a total installed capacity of about 40.4 million tons. About 82% of the cement capacity was controlled by four companies, of which the two principal ones were Société des Ciments Français (22 plants), and Ciments Lafarge France (18 plants).

Fertilizer Materials. — *Phosphate.* — France had no significant production of phosphate ore during 1975. A small output (18,000 tons) of phosphatic chalk (about 10% P_2O_5) from a deposit in the Département of Somme was the only natural source of phosphate in the country. However, slag from iron and steel plants remained a source of phosphate and accounted for 15% to 20% of supply.

Potash.—Consolidation of the producing units in Alsace continued during 1975. A plant located at Einsisheim was closed and preparations were underway for closing the mine and plant at Bollwiller sometime in 1976. Construction continued on a potash plant at Marie-Louise.

Potash production as well as consumption declined during 1975, interrupting a steady growth. Mines de Potasse d'Alsace (MDPA) was the sole producer of mined potash. Domestic output was more than adequate to meet demand, and France remained a net exporter of potash.

Fluorspar.—A new mine located at Tarn started production. The mine was rated at 20,000 to 25,000 tons per year of acid-grade fluorspar and was operated by the Société Minière de Trebas. About 80% of fluorspar production was controlled by three companies: PUK, with operations at Tanneron (Var), Langec (Haut-Loïre), and Paulinet and Reyssac-Montroc (Tarn); Société Denain-Anzin Minéraux with operations at Escaro (Pyrénées-Orientales); and Compagnie Française de Minerais d'Uranium (CFMU) with facilities at Reclesnes (Saône-et-Loire). Although production of ore increased, output in terms of CaF_2 content remained at the same level as in 1974 reflecting a lower average content of CaF_2. In 1970 French fluorspar ores contained about 63% of CaF_2, while in 1975 this figure had declined to only 45%. Domestic output was more than adequate to meet demand and France was a net exporter of fluorspar. Consumption continued to grow, mostly in the chemical industry.

Sulfur.—The principal source of sulfur was natural gas produced in the region of Lacq. In addition, some sulfur was recovered by desulfurization units at petroleum refineries. Small quantities of pyrite were also processed for sulfur recovery. Reflecting general economic conditions, output as well as consumption was down.

Other Nonmetals.—France also produced diatomite (mines in central and southern France), gypsum, pumice, and talc but no major events were reported during 1975.

MINERAL FUELS

During 1975, France remained dependent on imported energy to meet demand. Imported petroleum remained the principal energy source in the country. Table 4 shows supply and apparent consumption of primary energy.

Coal.—During 1975, the rate of decline in coal output slowed, perhaps signaling a positive reaction to measures taken by the French Government in 1974. These measures were aimed at reviving the coal industry of the country, and at lowering dependence of France on imported fuels. The small decline in output reported during 1975 was an excellent showing in the context of the overall economic slowdown. Under normal circumstances, lower energy consumption, triggered by recession, would have resulted in a far lower output of coal. High prices for imported liquid hydrocarbons were also a factor in improved performance of the French coal industry.

The coal industry was preparing for increased production. Modernizing the Merlebach, and Simon-Wendel mines in Lorraine, and preliminary work for reopening the Saint-Fontaine mine (Lorraine) were the focal points. The French coal industry, operated by the Government-owned Charbonnages de France, was concentrated in three basins: Nord/Pas-de-Calais (northern France), Lorraine (northeastern France), and Centre-Midi (central and southern France). These basins accounted for virtually all of the country's coal output. In general, operating mines were deep, with gas, water, and thin seams. Salient statistics on the coal industry are shown in table 5.

Coke.—The principal events in the coke producing industry in Lorraine were completing maintenance of the Coppee de Carling 3 coking battery, beginning regular maintenance of the Carling 2 coking plant, and constructing a rotary kiln to produce special coke, also at Carling. In the Nord/Pas-de-Calais basin, the changing of refractory lining continued in various coking furnaces. In Aquitaine, closing a coking plant at Loire late in 1974 resulted in lower coke production at the basin. Production of coke and semicoke in the three basins, in thousand tons for 1973–75, follows:

	1973	1974	1975
Nord/Pas-de-Calais	4,245	3,632	3,112
Lorraine	2,515	2,519	2,139
Centre-Midi:			
Aquitaine	353	358	414
Lorie	224	132	--
Total	7,337	6,281	5,665

Source: Charbonnages de France. Rapport de Gestion (Paris), 1975, p. 79.

Table 4.—France: Supply and apparent consumption of energy-producing materials for 1974 and 1975

(In million tons of standard coal equivalent) [1]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Fuel-wood	Hydro-elec-tric power	Nu-clear power
1974:							
Production	48.1	26.7	2.8	9.9	(2)	7.0	1.7
Imports	250.6	21.3	214.8	14.5	(2)	(2)	(2)
Exports	16.1	1.7	14.4	--	(2)	(2)	(2)
Apparent consumption	282.6	46.3	203.2	24.4	(2)	7.0	1.7
1975:							
Production	48.5	26.8	2.6	9.7	(2)	7.3	2.1
Imports	213.7	20.4	178.3	15.0	(2)	(2)	(2)
Exports	19.2	1.3	17.9	--	(2)	(2)	(2)
Apparent consumption	243.0	45.9	163.0	24.7	(2)	7.3	2.1

[1] 1 ton of standard coal equivalent (SCE) = 7,000,000 kilocalories.
[2] Less than ½ unit.

Source: Annales des Mines, September–October 1976, p. 17.

Table 5.—France: Salient statistics of the coal industry
(Thousand metric tons unless otherwise specified)

	1973	1974	1975
Production:			
Nord/Pas-de-Calais	10,404	9,011	7,715
Lorraine	10,111	9,066	10,021
Centre-Midi:			
Aquitaine	r 1,187	1,184	1,084
Avergne	469	424	1,414
Blansy	1,400	1,446	1,554
Cevennes	985	836	822
Dauphine	430	375	384
Loire	696	554	420
Provence (lignite)	1,454	1,604	1,545
Total	6,621	6,423	7,223
Region Landaise (lignite)	1,310	1,155	1,641
Other mines	11	NA	NA
Grand total	28,457	25,655	25,600
Average number of days worked, all mines	239	230	234
Average daily output, all mines	119	112	109
Number of workers:			
Underground, all mines	44,903	42,106	41,032
Overall, all mines	92,026	87,166	85,413
Production per man-shift (tons):			
Underground, all mines	2,865	2,931	2,889
Overall, all mines	1,852	1,869	1,888
Stocks at yearend, all mines	3,915	3,618	6,162

r Revised. NA Not available.

Source: Charbonnages de France Statistique Annuelle, Edition 1976. Paris, pp. 8–11.

At yearend 1975, installed capacity in French coking plants was about 19,055 tons of coke per day. During 1975, coking plants operated at about 81% capacity.

The outflow of coke and semicoke to various sectors of the economy, in thousand tons and percentage of total during 1973–75, follows:

	1973	Percent	1974	Percent	1975	Percent
Steel industry	4,627	61.6	3,629	55.3	2,638	54.3
Other industries	1,231	16.4	1,290	19.6	1,008	20.8
Small industries	298	4.0	232	3.5	157	3.2
Exports	861	11.4	964	14.7	642	13.2
Household consumption	498	6.6	451	6.9	410	8.5
Total	7,515	100	6,566	100	4,855	100

Source: Charbonnages de France, Rapport de Gestion (Paris), 1975, p. 79.

Natural Gas.—There were a number of important events related to the natural gas industry during 1975. However, no major new discoveries were made public and most of the activities were related to construction of a trunk pipeline, expansion and renovation of the distribution network, and construction of underground storage.

Completion of some sections of the Taisnieres-sur-Hon-Ferrolles-Attilly pipeline (this pipeline was intended for transportation of natural gas produced in the North Sea), construction of additional lines parallel to the pipelines in Artois, Lorraine, Vindecy-Allerey (Dôle), and to the Saint-Valéry-sur-Somme-Bourseville trunk pipeline were the major activities of gas pipeline construction.

About 1,750 kilometers of new pipelines was completed for gas distribution in localities throughout the country. With new additions, the gas distribution network totaled approximately 71,000 kilometers. In addition, about 500 kilometers of gasline was repaired during 1975. Construction of underground storage for gas continued in Tersanne. Five of 14 storage cavities in the salt dome were completed. Construction started for a new underground gas storage area near Erez. Capacities of these two new storage areas were not made public.

To assure future supplies of gas to consumers in France, new contracts for gas deliveries were signed with the U.S.S.R. (pipeline, starting in 1980), Norway (pipeline, starting in 1978), and Iran (liquefied natural gas (LNG), starting in 1981).

The region in the southwest of France and, in particular, the region of Lacq remained the principal producing area of natural gas. Compagnie Française du Methane and Société Nationale des Gas du Sud-Ouest were the principal producers. Natural gas from Lacq accounted for about 39% of domestic consumption. Algeria (LNG), the U.S.S.R. (pipeline), and the Netherlands (pipeline) were the principal suppliers of imported natural gas.

Petroleum.—France remained heavily dependent on imported crude oil to meet demand in 1975. The following tabulation shows principal sources of France's imported crude oil supply:

Source	Percent of total
Middle East	78
Africa	18
Europe	2
U.S.S.R.	1
Venezuela	1

Approximately 1% of the crude oil delivered to refineries was produced in the country. Stern conservation measures, mild winters, and introduction of nuclear energy to produce electricity resulted in lower consumption during 1975 (about 8.5% lower than that of 1974). To explore and develop new sources of petroleum and modify refinery capacity, large investments are necessary. The following tabulation shows past investments in the French petroleum industry for selected years, in millions of current French francs:

	1960	1970	1973	1974	1975 [e]
Exploration and production	383	362	170	231	350
Refining	217	1,534	1,288	1,460	1,090
Stocks and distribution	298	1,567	1,732	1,508	1,443
Pipelines	13	176	97	114	51
Tankers	206	510	1,343	1,837	1,517
Other investments	36	194	237	221	397
Total	1,153	4,343	4,867	5,371	4,848

[e] Estimated by Union des Chambres Syndicates de l'Industrie du Petrol.
Source: L'Industrie Française du Petrole (Paris), 1975, p. 32.

Exploration.—Petroleum companies operating in France have increased investments in exploration and production when compared with expenditures in 1974. At yearend, all permits for exploration in force covered an area of 116,033 square kilometers. During 1975, new permits for exploration granted by French authorities covered an area of 45,076 square kilometers on land and 42,000 square kilometers offshore. Most of the permits on land were in the Aquitaine subbasin in the Basin de Paris; offshore locations were in the Atlantic Ocean in the so-called "Mer d'Iroise".

Several successful results of exploratory drilling were made public during 1975. Natural gas was discovered in Comminges (Lannemazan) and in Pan-Tarbes, both on the Meillon concession. Traces of crude oil were discovered in a well drilled near Grenade sur Adour.

Production.—Production decreased because of a decline in reservoir energy at producing fields. A new field, Montastruc, located in southwest France, came onsrteam in 1975. Data on capacity, geology, and oil quality were not made public. In addition, French companies shared in production abroad. The following tabulation shows domestic output by basin, production by French companies abroad, and output of crude oil derived from French oil concession rights, in thousand tons:

	1970	1975
France:		
Aquitaine	1,977	797
Basin Parisien	332	231
Total crude oil	2,309	1,028
Natural gas liquids from Lacq	605	761
Grand total liquid hydrocarbons	2,914	1,789
Production abroad by French interests:		
Europe	--	1,583
Middle East	43,506	53,690
Africa	38,156	26,759
Oceania	--	604
North America	1,264	1,953
Total	82,926	84,589

Refining.—Reduction in the consumption of petroleum refinery products resulted in low utilization of installed capacities at French refineries. During 1975, refineries operated at 64% of the installed capacity of 169 million tons per year. Low demand also resulted in curtailment of investments in new refineries. However, investment continued for modifications of existing refineries aimed at energy conservation in refineries, improvement in quality of products and environmental protection, and adaptation of yield to new market demand. The future market for petroleum products is expected to change. Demand for light products is expected to increase, but demand for fuel oil is expected to decline because government planning is emphasizing nuclear power. French refinery capacity by process, in tons per day, on January 1 for selected years follows:

	1965	1970	1975	1976
Reforming:				
Thermal	6,785	1,900	--	--
Catalytic	21,910	39,025	58,290	58,290
Desulfurization:				
Thermal	7,300	6,600	6,600	5,600
Catalytic	16,332	18,788	28,720	28,720

Table 6 shows location, ownership, and capacity of petroleum refineries in France.

Table 6.—France: Location, ownership, and capacity of petroleum refineries for selected years

(Million tons of crude oil)

Location	Ownership	1965	1970	1975
North:				
Flanders (Madyck)	Cie. Française de Raffinage (CRF)	--	--	6.0
Dunkerque	Société Française (BP)	5.5	5.5	5.5
Valenciennes	Antar—Petróles de L'Atlantique (Antar P.A.)	--	3.5	3.5
Vallee de la Seine:				
Normandie (Gonfreville)	CRF	10.2	14.3	23.3
Petit-Couronne	Shell Française (Shell)	5.5	9.2	18.8
Port-Jerome	Esso E.A.F.	4.0	7.2	7.2
N.-D.-de-Gravenchon	Mobil Oil Française (Mobil)	1.1	3.6	3.6
Vernon	S.F. (BP)	--	3.0	3.0
Vexin (Gargenville)	ELF France	--	3.6	6.0
Ile-de-France (Grandpuits)	----Do	--	3.6	3.6
Atlantic:				
Donges	Antar P.A	3.9	4.6	8.3
Vern-sur-Seiche	----Do	--	1.4	1.5
Pauillac	Shell	.5	.5	4.0
Bordeaux	Esso S.A.F	2.0	2.8	2.9
Ambes	ELF France	1.8	2.0	2.1
Mediterranee-Rhone:				
Frontignan	Mobil	1.7	1.7	6.0
Berre	Shell	6.0	7.0	13.5
Lavera	S.F. (BP)	4.4	4.4	11.0
Provence (La Mede)	CRF	6.4	10.2	10.2
Fos-sur-Mer	Esso S.A.F	--	3.0	8.0
Feyzin	ELF France	2.0	6.0	8.8
East:				
Herrlisheim (Strasbourg)	Ste. de la Raffinerie de Strasbourg	3.3	4.4	4.4
Reichstett (Strasbourg)	Cie. Rhenane de Raffinage	3.7	3.7	3.7
Lorraine (Hauconcourt)	Ste. de la Raffinerie de Lorraine	--	--	4.5

Uranium.—During 1975, France continued developing its uranium resources and constructing nuclear powerplants. The aim remained to have about 50% of electric power generating capacity nuclear by 1985.

The Commission d'Energie Atomique (CEA), a French Government agency, and private companies conducted exploration for uranium throughout France.

The CEA continued exploration activities near its mines at Limousin, Forez, Vendée, in areas of Berry-Bourbonnais and Var in the Vosges, and in Rouergue. New exploration started in eastern Languedoc and in Gironde.

Private companies, including CFMU, Dong-Trieu, Société Centrale de l'Uranium et de Minerais et Metaux Radioactifs (SCUMMR), and Compagnie Industrielle et Minière (CIM), explored mostly in the southern and western part of the Central Massif and in Bretagne.

No new uranium mining or processing facilities came onstream during 1975. However, CFMU completed expansion of its Lozer mines. In addition, CFMU and La Société des Mines d'Uranium du Centre (SDMUC) made a decision to start joint production from the small Limousin deposits during 1976. Furthermore, as a long-range plan CEA continued to evaluate the economic and technical aspects of starting output from the fairly large deposits at Lodevois, Hèrault. Dong-Trieu, part of the

Empain-Schneider group, was preparing to start production from deposits on a concession located at Mailhac-sur-Benaize in Haute-Vienne. SCUMMR was planning to construct a uranium beneficiation plant at Saint Pierre, Cantal.

Mine production of uranium in France in 1975 was as follows:

Company	Mine	Ore (thousand tons)	Approximate U content (kilogram per ton)	U recovered by leaching	Total U recovered (tons)
CEA	La Crouzille	245,000	2,5	42	652
Do	Vendée	248,000	1.7	29	449
Do	Forez	124,000	3.7	3	458
SIMURA	Morbihan	9,000	4.4	--	39
Do	Cantal	16,000	2.7	--	43
CFMU	Lozere	360,000	0.2–1.2	--	211

Source: Annale des Mines—August–September 1976, p. 31.

To assure an adequate supply of uranium to France, French companies explored for and produced uranium in Gabon, Niger, and Canada. This output was processed in France and used in French installations.

The Mineral Industry of Gabon

By Janice L. W. Jolly [1]

The mineral production of Gabon continued to improve in 1975 as crude petroleum (up 7%), uranium (up 16%), and cement (up 16%) showed production increases over those of 1974. Manganese production remained relatively stable and gold production decreased by about 42%. For the next 5 years, the progressive rise in the gross domestic product (GDP) was expected to continue, but at a more modest annual rate of about 12% to 15%. Petroleum production was to be held to a ceiling of about 98 million barrels per year, thereby contributing about $1.2 billion [2] to the economy. Production of manganese was not expected to expand noticeably until transportation difficulties are overcome by the completion of the Trans-Gabon Railroad. The reliance on foreign technology, personnel, and foodstuffs was expected to contribute to maintaining a rate of price inflation above 20% per year. Progress was being made on a number of development projects including the Trans-Gabon Railroad, the mineral port at Santa Clara, construction of a second petroleum refinery at Port-Gentil as well as an extension to the existing Port-Gentil petroleum refinery, and a ferroalloys plant.

The third 5-year plan (1976-80) was in preparation and Gabon's national budget for 1976 was set at $892 million, up 32% from the $674.9 million allotted for 1975. Total government revenue, which more than tripled during 1975, was expected to increase by 29% more in 1976. The new 5-year plan was expected to concentrate on diversification from mineral extraction activities into a widely spread processing sector. Emphasis was to be placed on industries that had been somewhat overshadowed by the concentration on petroleum processing in the second 5-year plan. The Port-Gentil ammonia plant was scheduled to open in 1977 with an annual capacity of 60,000 tons, while new discoveries of limestone at N'Toum, 50 kilometers east of Libreville have added impetus to plans for a new cement works to open at yearend 1977 with an annual production of 300,000 tons. The 1976–80 plan should also lay the foundations for iron, steel, and aluminum works as well as nuclear power generation. Gabon was already gathering expertise and had reached technical cooperation agreements with the Republic of Korea and Brazil for exportation of refined uranium.

The 1975 budget for Gabon was balanced with receipts and expenditures at about $674.9 million. Oil receipts contributed about $396.8 million. Approximately $104.7 million (or about 22% of development expenditures) was spent on roads and bridges (850 kilometers of main roads were to be bulit in 3 years), and $17.1 million on water and hydroelectric power projects. About $38.1 million was allotted in 1975 for increasing State participation in various industrial organizations. The 1976 fiscal year operating budget for the Trans-Gabon Railroad was fixed at about $11 million, representing an increase of about $1.5 million over that of 1975. On February 4, 1975, the Gabonese signed a loan agreement with France raising the amount of French aid for the Trans-Gabon Railroad to about $57.5 million. Of this, $15.6 million represents a nonreimbursable grant, while

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[1] Physical scientist, International Data and Analysis.

[2] Where necessary values have been converted from African Financial Community francs (CFAF) to U.S. dollars at the rate of CFAF224.3=US $1.00.

the remainder ($41.9 million) is a supplier credit. Japan granted a loan for the purchase of railway cars. The Algerian Bank for Development loaned $3.8 million to furnish 130 railway cars. The Export-Import Bank loaned $2.8 million for engineering services in construction of the railroad. This loan will be combined with about the same amount from private sources not as yet designated, and the Government of Gabon will put up cash equal to about 10% of the contract (about $612,000). Two French companies, CIT-Alcatel and Cables de Lyon Alsacienne & Geoffroy Deldre S.A. will install a $4 million telecommunications system for the railway. Westinghouse Air Brake Co., a French subsidiary of American Standard Inc., received an order for braking equipment for 400 Trans-Gabon railway cars. A U.S. firm, Soros Associates, signed a contract to design the new mineral port at Santa Clara for direct shipment of manganese and iron. Soros was to complete the site investigations and detailed design of port facilities within 18 months. The new port will handle 180,000 to 250,000 deadweight-ton class vessels about 7 kilometers offshore.

The Gabonese Government acquired 25% of the new Société Italo Gabonaise des Marbres (SIGAMA), which was formed at yearend 1974 with an Italian group holding 75% of the capital. Two new industrial companies were formed in 1975: The Société Gabonaise Industrielle de Construction, formed with headquarters in Libreville and a capital of $125,000 by Essence et Lubrifiant de France of Gabon (Elf-Gabon) and the Société Française d'Entreprises de Dragages et de Travaux Publics; and the Société Nationale Gabonaise d'Etudes, formed with a capital of $208,000 for undertaking public and urban civil engineering and economic studies.[3] Elf-Gabon also established the Société Gabonaise de Forages at Libreville with an initial capital of $417,000. The creation of a France-Gabon Bank in Paris was under study. Negotiations included the Suez-Mines Union and the Odier-Bungener-Courvoisier Bank. Capital was to be divided with 60% Gabonese interest and 40% French. It was to be essentially a business bank with a role in recycling Gabonese capital and participating in the financing of large development projects in Gabon.

In January 1975, Gabon and Upper Volta drew up new job contracts stipulating the rights and obligations of both States relating to Upper Voltan migrant workers in Gabon. Discussions were held with India for economic and commercial cooperation between the two countries when a delegation of Indian research experts visited Gabon early in 1975. An economic accord was signed on July 9, 1975, in Seoul providing for export of enriched uranium, manganese, and crude petroleum to the Republic of Korea. Gabon also signed and ratified the Lomé Convention. The 44th Organization of Petroleum Exporting Countries (OPEC) ministerial conference and the first conference ever to be held in Gabon took place in June 1975. Gabon was admitted to OPEC as a full member. This was followed on June 23 to 27, 1975, by an international symposium on the natural nuclear reactor discovered at the Oklo uranium occurrence, placing Gabon at the center of the scientific community's attention. A mission of Romanian geologists also visited the principal mineral deposits of Gabon in 1975.

Until 1972, all electricity production was by thermal power. By 1975, power was derived from 14 thermal stations and two hydroelectric stations at the Kinguele dam and at Oyem. There are plans to extend the capacity at Kinguele, to build a plant at Poubara, and to construct another dam and reservoir above the Kinguele complex. The start of service at the Poubara dam was forecast to take place within 2 years. A feasibility study for the Poubara dam was being done by the French Electricité de France. The new dam was to be constructed on the Ogooué River, about 20 kilometers from Franceville. Initial production will be about 4,400 kilowatts; later it will be raised to 13,000 kilowatts. The Kinguele Dam (20 megawatts) is situated 100 kilometers from the Gabonese capital and 45 kilometers from Kango. The work was initiated in 1969 and cost an estimated $17.8 million. About $5.8 million originated from the Fonds d'Aide et Cooperation (FAC), $4.5 million from the

[3] Industries et Travaux d'Outre-Mer (Paris). Afrique du Centre (Central Africa). V. 23, No. 264, November 1975, p. 871.

Caisse Centrale de Cooperation Economique, \$4.5 million from France in the form of credits, and \$2.4 million was supplied by Gabon.[4] A study was awarded for the advance planning of a gas-powered turbine station at Port Gentil.

PRODUCTION AND TRADE

The mineral industry, including refinery production contributed \$1,024.4 million to Gabon's economy in 1975. Crude petroleum production showed a modest increase to 81.9 million barrels in 1975, valued at \$832 million. Petroleum refinery output was valued at \$50.3 million. Butane produced from natural gas was valued at \$1.1 million.

Uranium production was valued at an estimated \$36.5 million in 1975 for an average price of about \$17.80 per pound of uranium concentrate. This represented a threefold increase in value over the 1974 production. Approximately 2.2 million tons of metallurgical grade and 40,000 tons of battery and chemical grade manganese ore were produced in 1975, valued at an estimated \$101.2 million. Gold, valued at about \$543,000 and cement (92,500 tons) valued at \$2.8 million were also produced.

The export value for all materials of \$800.2 million for 1975 was down from the export value for 1974 of \$1,047.4 million. In 1975, this included \$721.5 million for exported crude petroleum. Uranium, manganese, and gold were also exported. Total imports (c.i.f.) for 1975 were valued at \$448.3 million.[5]

[4] Industries et Travaux d'Outre-Mer (Paris). Gabon. V. 23, No. 263, October 1975, p. 819.

[5] International Monetary Fund. International Financial Statistics. Gabon. V. 29, No. 6, p. 157.

Table 1.—Gabon: Production of mineral commodities

Commodity [1]	1973	1974	1975 [p]
Gas, natural:			
Gross production [e] ---- million cubic feet --	14,000	19,000	21,000
Marketed production ---- do ----	1,402	1,611	[e] 1,800
Gold, mine output, metal content ---- troy ounces --	11,221	7,298	4,207
Manganese:			
Ore, 50% to 53% Mn, gross weight thousand metric tons --	1,877	2,059	2,190
Pellets, battery and chemical grade, 82% to 85% MnO_2, gross weight ---- do ----	42	70	40
Total ---- do ----	1,919	2,129	2,230
Petroleum:			
Crude ---- thousand 42-gallon barrels --	55,045	73,548	81,948
Refinery products:			
Gasoline ---- do ----	1,347	1,116	1,097
Jet fuel and kerosine ---- do ----	891	746	753
Distillate fuel oil ---- do ----	2,195	1,832	1,864
Residual fuel oil ---- do ----	2,820	2,533	2,113
Other ---- do ----	64	56	44
Refinery fuel and losses ---- do ----	189	1,687	574
Total ---- do ----	7,506	7,970	6,445
Uranium oxide (U_3O_8) content of concentrate ---- metric tons --	[r] 766	908	1,097

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

[1] In addition to the commodities listed, a variety of crude construction materials (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.

Table 2.—Gabon: Apparent exports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
Copper metal including alloys, all forms	26	--	
Iron and steel:			
Ore and concentrate	24,210	57,915	All to United States.
Metal, scrap	--	395	All to Spain.
Manganese ore	1,291,966	1,466,890	France 719,497; Norway 227,371; Italy 153,187; United States 136,184; Japan 116,974.
Petroleum:			
Crude thousand 42-gallon barrels	25,336	47,389	France 16,772; United States 12,440; West Germany 6,948; United Kingdom 4,916.
Refinery products, residual fuel oil do	775	522	Italy 266; United Kingdom 130; Canada 122.
Uranium and thorium, ore and concentrate	1,078	(1)	(1)
Other:			
Ore and concentrate	--	148	All to France.
Crude minerals, n.e.s	--	4,053	Do.

[1] Value only reported at $12,269, all to France.

Source: Statistical Office of the United Nations. 1973 and 1974 editions of World Trade Annual, v's 1, 2, and 3, Walker and Co., New York.

Table 3.—Gabon: Apparent imports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973	1974
Abrasives, grinding and polishing wheels and stones	--	15
Aluminum metal and alloys, all forms	127	311
Barite and witherite	1,890	5,567
Cement, hydraulic	27,641	40,029
Clay products:		
Nonrefractory	1,409	2,438
Refractory	801	100
Copper metal and alloys, all forms	44	77
Iron and steel semimanufactures	57,070	72,872
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	--	82
Kerosine do	--	153
Distillate do	--	241
Lubricants do	16	32
Unspecified do	(1)	64
Sodium and potassium compounds, caustic soda	440	578
Titanium, oxides and hydroxides	--	63
Other:		
Crude, unspecified	227	1,738
Building materials of asphalt, asbestos, and fiber cement, including unfired clay brick	--	310

[1] Less than ½ unit.

Source: Statistical Office of the United Nations. 1973 and 1974 editions of the World Trade Annual, v's 1, 2, and 3, Walker and Co., New York.

COMMODITY REVIEW

METALS

Copper.—The French Bureau de Recherches Géologiques et Minières (BRGM) was prospecting for copper and gold in the N'Djole-Kolissen region. An exploration permit was requested by the BRGM for the Eteke-Mavikou region.

Iron.—Contingent upon completion of the Trans–Gabon Railroad and related infrastructure, possible steel production was being considered utilizing the Belinga iron deposits. The best location for the steel plant was considered as being near Santa Clara. Approximately 10 million tons per year of iron ore could be produced at Belinga, 40% of which would be exported as pellets and 60% of which could be utilized in the local steel plant, which might produce 4 million tons of steel per year. The investment speculated as necessary for the steel plant was estimated at $1,033 million. Romania was expected to participate in Société des Mines de Fer de Mékambo (SOMIFER), which will exploit the Belinga iron deposit. Saudi Arabia and Japan were both reportedly interested in buying the potential iron ore output from Gabon.

Manganese.—A ferromanganese subsidiary, Société Gabonaise de Ferroalliages (SOGAFERRO), was set up by Compagnie Minières de l'Ogooué S.A. (COMILOG) (15%), Union Carbide Corp. (10%), Okura Trading Co., Ltd., (25%), the Gabon Government (10%), and other European and U.S. interests with an initial capital of about $4.5 million. A ferroalloys plant was to be built at Franceville with completion scheduled for 1981, to coincide with completion of the large dam at Grand Poubara and the Trans–Gabon Railway. An estimated electrical supply of 4,000 kilowatt-hours per ton would be necessary. The annual capacity of the plant would be about 85,000 tons ferromanganese and 50,000 tons silicomanganese, requiring an estimated electrical consumption of about 540 million kilowatt-hours. The total investment required was projected to be about $45 million.

Uranium.—The uranium-vanadium deposit of Mounana, in the province of Haut-Ogooué, is situated approximately 25 kilometers north of the Moanda manganese deposit. It was discovered by geologists of the French Commissariat à l'Energie Atomique (CEA) in 1956. The Compagnie des Mines d'Uranium de Franceville (COMUF) began open pit mining in 1961. The Mounana deposit is located in a fault wedge in coarse sandstones of Middle Precambrian age. The deposit is about 140 meters long, 40 meters wide, and 150 meters deep. It was worked by open pit methods to the 70-meter level and then by underground methods. Other pods were opened later near the main mine such as the Oklo where some very rich parts behave as fossil nuclear reactors. Water in porous host rock acts as a neutron moderator resulting in an impoverishment of U^{235} isotope, and a low U^{235} to U^{238} ratio. Reserves were estimated at 26,000 tons U_3O_8 (at $10 per pound). There are two distinct zones with the "black-ore zone" containing minerals of uranium and vanadium in their lower valencies, and an "oxide zone," about 40 meters thick, where aluminum, lead, and barium uranyl-vanadates form most of the mineralization.[6]

On the 15th of January 1976, a new agreement was signed in Libreville between Gabon and COMUF. The terms of the convention were to be in effect for 15 years retroactive to January 1975 and no sale was to be made without Gabon Government agreement of price and customer. Gross profits tax was to be raised from 25% to 50% and the company's turnover tax from the average 12% to a minimum of 28%. The export tax was to be raised from 4% to 7.22% on the f.o.b. value. COMUF agreed that Gabonese uranium will be processed as far as possible in Gabon. COMUF was to build a uranium refining plant over the next 2 years to supply nuclear plants to be built in Gabon. Between 1975 and 1982, investments in COMUF were expected to be on the order of $133.7 million.

The French CEA and the U.S. company Union Carbide Exploration jointly were to undertake prospecting for uranium in the Ogooué Lolo and Ogooué Ivindo areas. Six Japanese companies (Dowa, 18%; Mitsubishi Corporation, 18%; Mitsui and Co., Ltd., 18%; Okura Trading Co., 18%; C.

[6] Cesbron F., and P. Bariand. The Uranium-Vanadium Deposit of Mounana, Gabon. The Mineralogical Record, September–October 1975, pp. 237–249.

Itoh & Co., Ltd., 18%; and Nippon Mining, 10%) set up Atlantic Uranium Co. to further Japanese uranium interests in Gabon. Depending upon the outcome of operating negotiations between CEA and the Government on an exploration program, other Japanese companies (Sumitomo Metal Mining Co., Ltd., Furukawa Co., Nittetsu Mining) may also join the Atlantic Uranium group.

NONMETALS

Marble.—Following the liquidation of Société Gabonaise de Marbrerie et Matériaux (SOGAMAR), a new company was created in 1974 by contract between the Government and a new Italian group. The new company, SIGAMA was formed with the Italian group COGEPI (50% Boatti finance group and 50% Saifi of Fiat) holding 75% and the Gabon Government 25% of the capital, which was estimated to be about $1.1 million. SIGAMA will extract, transport, and sell marble from the quarry at Koussou near Tchibanga (Dousee-Ossou). Reserves were estimated at 2 million tons,[7] and in the first phase, the annual production was expected to be about 40,000 tons per year. An investment of about $4.4 million was visualized for construction of the new complex.

MINERAL FUELS

Petroleum.—In November 1973, Gabon became an associate member of OPEC and in 1974, oil postings were brought into line with other OPEC members. In 1975, Gabon became a full member of OPEC. Gabon has set stiff concessions for foreign oil companies but recognized their vital role in oil development and has officially spoken out against full nationalization. Royalties and tax are now paid on the full posted price instead of on the realized price, and the tax rate has been raised to 47% of national profits based on posted prices, compared with the previous 42% based on realized price.

Elf-Gabon spent $57.9 million for exploration in 1975, compared with $25 million in 1974. Offshore prospecting was continued with three rigs in use on the Barbier Marine, Breme Marine, and Grondin-Madroo Marine sites. The potential of the Breme offshore oilfield was confirmed by four wells drilled under a joint development program by Ocean Drilling and Exploration Co. (ODECO) and Elf-Gabon. Elf-Gabon struck oil in the Port-Gentil Sud Marine I offshore exploration well. Elf-Gabon and Hispanica de Petroleos S.A. (Hispanoil) are each taking a 25% share in the 3,000-square-kilometer Iguelda Magumba offshore concession. Gulf which previously held the concession alone, will have a half share and will act as operator. Elf-Gabon, in partnership with Gulf, struck oil in the Banio Two well, and in partnership with Japan's Mitsubishi company has struck oil in Anguille Sud Ouest 1. The Compagnie Générale pour le Dévelopment des Richesses Sousmarines, with headquarters in Paris, established a subsidiary at Port-Gentil for research and petroleum exploitation along the Gabonese coast.

The construction of a second petroleum refinery was started at Port-Gentil in an effort to raise the refinery capacity of Gabon from 1.2 million to 2.2 million tons per year. The capital of the new refinery was split between the Gabon Government (30%) and Elf-Gabon (70%) and necessitated an investment of approximately $62.4 million. The petroleum terminal at Cap Lopez, north of Port-Gentil, was inaugurated on October 1, 1975. The new loading dock will handle 250,000 deadweight-ton tankers. A new asphalt plant was also inaugurated on May 29, 1975, which will have an annual production of 17,000 tons. About 7,000 tons will be used locally and the rest will be exported to neighboring countries. The asphalt plant represented an investment of $3.1 million by the French companies Entreprise de Récherches et d'Activités Pétrolières (ERAP) and Elf-Gabon. The Gabon State has a half-share in the new national company Pizo, which was to take over the oil products marketing operations of AGIP S.p.A., Elf-Gabon, and Shell-Gabon on May 1, 1975. AGIP Elf-Gabon, and Shell each retain one-sixth interest in the new venture. Other private distribution companies, notably Texaco Overseas Petroleum Co. and Mobil Oil Gabon, Inc., will also continue to operate in Gabon. The Gabon Council of Ministers decided on December 17, 1975, to construct a new petroleum depot at Moanda and to expand the storage capacity at the Ndjole and Lambarene depots.

[7] Industries et Travaux d'Outre-Mer (Paris). Gabon. V. 23, No. 263, October 1975, p. 805.

The Mineral Industry of East Germany

By Nikita Wells [1]

In 1975, East Germany remained the world's leading producer of lignite and the third largest producer of potash accounting for approximately one-third of the world's lignite output and one-eighth of the world's output of potash. Apart from these two commodities, salt, and building sand, East Germany is relatively poor in mineral raw materials and thus heavily dependent upon imports.

East Germany reported attaining the goals of the past 5-year plan (1971–75) and showed an over fulfillment in some areas. National income as reported for 1975 increased by 6.6 billion marks[2] to 141.6 billion marks; a 5% increase over that of 1974. Production of industrial goods increased by 14 billion marks, or 6.4% over that of 1974, thus exceeding the National Economic Plan. Productivity in the sphere of the industrial ministries increased 5.8%. The Ministry for Ore Mining, Metallurgy, and Potash had fulfilled the 1975 plan with 100.4%; the Ministry of Coal and Power fulfilled the plan with 101.3%.

Legislation and Government Programs.—East Germany anticipates maintaining rapid growth throughout the coming 5-year plan (1976–80).[3] Capital investments during this period are to be approximately 240 to 243 billion marks, compared with 183 billion in the 1971–75 plan.

The produced national income for 1980 as compared with 1975 is to increase by 27% to 30% and should achieve 182 billion to 185 billion marks. Industrial production is to increase by 34% to 36%, while the rise in productivity is to be 30% to 32%. Capacities are to be increased in order to produce the following by 1980:

Electrical energy billion kilowatt hours	104–109
Lignite million tons	250–254
Brown coal briquets do	45–47
Natural gas billion cubic meters	7.8–8.2
Manufactured gas do	5.8–6

The principal goals for individual commodities in the coming 5-year plan are as follows:

1. The lignite industry is to provide the national economy with solid fuels at the lowest possible cost. This is to be done by raising the capacity and efficiency of existing strip mines and processing facilities. Capacities of the strip mines at Profen-South Greifenhain, Bergdorf, Olbersdorf, and Goitshe are to be expanded, and strip mines are to be developed at Jaenschwalde, the Grotzsch Triangle, Delitzsch-Southwest, Schlabendorf-South, Baerwalde-West, and Cospuden II. By 1980, development should be started at the Gräbendorf, Cottbus-North, Delitzsch-South, and Reichwalde-South coalfields. The exploration program for lignite is to be carried out with the goal of finding 2 billion to 3 billion tons of reserves that can be mined on an industrial scale.

The productive capacity of existing briquet plants is to be maintained by reconstruction measures. Gas works and coking plants are to be operated and reconstructed where necessary, and the capacities of the Schwarze Pumpe and Lauchhammer coking plants are to be increased.

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[1] Physical scientist, International Data and Analysis.

[2] Values have not been converted from East German currency units (marks) to U.S. dollars owing to fluctuating exchange rates. The exchange rate as of October 1975 was 2.55 marks =US$1.00.

[3] Neues Deutschland (East Berlin). Jan. 15, 1976, pp. 3–14.

2. The search for natural gas is to be concentrated only in the most promising areas in order to determine new natural gas deposits and consequently provide high output of natural gas for an extended period. Gas supplies are to be stabilized by the construction of more underground gas storage facilities for indigenous and imported natural gas. The modernization of local gas distribution networks is to continue. Imported natural gas from the U.S.S.R. is to be used mainly for industrial purposes and especially for the production of nitrogen fertilizers.

3. To assure the supply of raw materials to the chemical industry and to provide motor fuel and lubricants to the national economy, oil processing is to increase from 17 million tons in 1975 to 22.5 million to 23 million tons in 1980. Most of the increase in crude oil supplies is to be imported from the U.S.S.R. The technology of oil refining and petrochemical production is to be further developed for more comprehensive utilization of crude oil.

4. The share of electric power output, as produced by nuclear powerplants, is to increase from 9% in 1975 to approximately 16% by 1980.

5. The potash industry is to be further developed, and by 1980 the production of potash fertilizers is to increase 13% to 18% over that of 1975. By 1976, output of potassium fertilizers was to have reached 3.2 million tons. Exploration for potash is aimed at finding 1.8 billion tons of reserves suitable for commercial potash production. The Zielitz Potassium Combine is to meet its planned output and expand capacity.

6. Nitrogen production is to be raised from 539,000 tons in 1975 to 745,000 tons in 1976 and to 910,000 to 925,000 tons in 1980. This is to be accomplished by increased production of ammonia and urea at the Piesteritz Fertilizer Combine VEB. The manufacture of phosphate is to increase from 461,000 to 510,000 tons per year.

7. In ferrous metallurgy, rolled-steel production is to be increased 30% to 34%. This is to be accomplished by expanding existing rolling mills, including the Riesa Pipe Factory No. 2. Further expansion of the East Ironworks Combine is to take place as planned. The recovery of steel scrap is to be increased 14% to 18%.

In nonferrous metallurgy, production based on domestic raw materials and the reclamation of secondary raw materials is to be increased. A constant copper production is to be maintained at the Sangerhausen copper ore mines with the help of mechanization in mining and ore dressing. In aluminum production, more efficient processing and increased use of aluminum scrap are to be employed, and the Lauta alumina plant is to be renovated. Tin production is to be increased 43% to 45% by the reconstruction and expansion of existing capacities for ore mining and processing. Efforts to discover copper and zinc are to be continued, and exploration is to be planned for tungsten and sulfide nickel ore deposits.

8. Cement production is to be increased 25% to 27% through better utilization of existing facilities and expansion of the Deuna cement works. Geological exploration for cement raw materials in the Pasewalk area must be completed by yearend 1977.

9. Foreign trade in the coming plan is to be dependent upon a tighter interlocking of the East German economy with the economies of the U.S.S.R. and the other COMECON[4] countries. An increase is to be made in the scientific, technical, and economic cooperation between these countries. However, foreign trade with European and non-European market economy countries is to be further developed. Economic relations are to also be expanded with the developing countries.

During the coming plan, East Germany's contribution to the expansion of Soviet primary material industries is to increase by almost a factor of four. In keeping with the "Long Term Agreement on Trade Turnover and Payments for 1976–1980," which was signed between the two countries in December 1975, the U.S.S.R. is to pay for East Germany's help by delivering raw materials. During this period, the U.S.S.R. is to deliver more than 88 million tons of oil, 21.6 billion cubic meters of natural gas, 21 million tons of coal, approximately 16 million tons of rolled steel, and large quantities of iron ore, nonferrous metals, chemicals, etc.[5]

[4] 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.

[5] Voitov, M. The Prospects of Trade and Economic Ties in 1976–1980 (U.S.S.R.–G.D.R.). Foreign Trade (Moscow), No. 4, April 1976, pp. 4–7.

PRODUCTION

In 1975, East Germany's iron and steel industry showed a moderate increase in output. Crude steel production increased 5.1%, pig iron 7.7%, and steel semimanufactures 4.4%, compared with 1974 levels. Iron ore resources are almost depleted and production is small. Production of most nonferrous metal ores was on the decline and production of primary copper became insignificant. A considerable effort was given to the salvage, recovery, and processing of secondary raw materials.

In the nonmetals industry, production of potash increased 5.4%, mainly due to the new developments at the Zielitz potash combine. Nitrogen fertilizer production increased an estimated 24% due to the operation of all three plants at Piesteritz. Nitrogen production is to keep increasing well beyond 1980.

In the mineral fuels area, production of lignite increased slightly, and plans are to keep production at the present level. Production of crude oil remained at an insignificant level, and little hope is envisioned in offshore drilling in the Baltic Sea. Natural gas production has leveled off, and a considerable effort is being made to keep the production from decreasing.

The total production of electrical energy in 1975 was 84,460 million kilowatt-hours, a 5.2% increase over that of 1974. Planned production for 1976 is 88,350 million kilowatt-hours.[6]

East Germany does not report production statistics on many of its mineral commodities; therefore, much of the data presented in the production table (table 1) was estimated.

[6] Neues Deutschland (East Berlin). Jan. 20, 1976, pp. 4–5.

Table 1.—East Germany: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum:			
Alumina	47,267	48,183	48,300
Metal, primary [e]	70,000	70,000	70,000
Cadmium metal, primary [e]	[r] 18	18	18
Copper:			
Mine output, metal content [e]	1,500	--	1,500
Smelter output [e]	1,500	--	1,500
Refinery output [e]	42,000	46,000	48,000
Iron and steel:			
Iron ore, gross weight [2] ... thousand tons	52	53	50
Pig iron ... do	2,202	2,280	2,456
Crude steel ... do	5,892	6,165	6,472
Steel semimanufactures (rolled products, forgings and pressings) ... do	3,876	4,099	4,281
Lead:			
Mine output, metal content [e]	7,000	4,000	2,000
Metal, refined including secondary [e]	20,000	20,000	20,000
Nickel [e]	[r] 2,000	[r] 2,200	2,400
Silver, mine output, metal content [e] ... thousand troy ounces	4,000	3,000	2,000
Tin:			
Mine output, metal content [e]	1,200	1,200	1,200
Metal including secondary [e]	1,200	1,200	1,200
Zinc:			
Mine output, metal content [e]	[r] 3,000	(3)	--
Metal including secondary [e]	[r] 15,000	18,000	18,000
NONMETALS			
Barite [e]	31,000	31,000	31,000
Boron minerals, processed borax, $Na_2B_4O_7 \cdot 10H_2O$ content	4,000	3,870	3,367
Cement, hydraulic ... thousand tons	9,548	10,099	10,653
Chalk [e] ... do	45	48	50
Fertilizer materials, manufactured:			
Nitrogenous, N content:			
Ammonium sulfate ... do	159	163	164
Calcium ammonium sulfate ... do	179	214	221
Unspecified ... do	73	59	154
Total ... do	411	436	539

See footnotes at end of table.

Table 1.—East Germany: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 p
NONMETALS—Continued			
Fertilizer materials, manufactured—Continued			
Phosphatic, P_2O_5 content:			
Superphosphate ____ thousand tons	205	208	226
Calcined phosphate ____ do ____	116	121	112
Thomas slag ____ do ____	14	9	13
Unspecified ____ do ____	68	72	76
Total ____ do ____	403	410	427
Potassic, marketable potash, K_2O equivalent ____ do ____	2,556	2,864	3,019
Fluorspar e ____ do ____	90	90	90
Gypsum and anhydrite:			
Crude e ____ do ____	340	340	340
Calcined ____ do ____	289	311	306
Lime and dead-burned dolomite ____ do ____	3,029	3,027	3,030
Pyrite:			
Gross weight e ____ do ____	140	140	140
Sulfur content e ____ do ____	58	58	58
Salt:			
Marine ____ do ____	51	51	51
Rock ____ do ____	2,236	2,287	2,380
Total ____ do ____	2,287	2,338	2,431
Sodium carbonate ____	779,971	804,080	818,208
Sodium sulfate ____	187,319	195,931	194,343
Stone, sand and gravel:			
Crushed stone ____ thousand tons	11,315	12,061	12,930
Sand and gravel ____ do ____	7,731	7,737	7,978
Sulfur:			
Elemental ____ do ____	90	89	85
Sulfuric acid ____ do ____	1,058	1,005	1,002
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous ____ do ____	753	594	540
Lignite ____ do ____	246,245	243,468	246,706
Total ____ do ____	246,998	244,062	247,246
Coke:			
From anthracite and bituminous coal ____ do ____	1,856	1,829	1,779
From brown coal:			
High temperature ____ do ____	1,875	1,970	2,041
Low temperature ____ do ____	3,864	3,897	3,506
Total ____ do ____	7,595	7,696	7,326
Fuel briquets (from lignite) ____ do ____	50,154	50,061	48,938
Gas:			
Manufactured ____ million cubic feet	170,004	173,571	181,446
Natural, marketed production e ____ do ____	247,625	273,052	280,000
Petroleum:			
Crude e ____ thousand 42-gallon barrels	r 2,500	2,500	2,500
Refinery products:			
Gasoline ____ do ____	23,262	24,493	24,934
Kerosine, jet fuel, distillate fuel oil ____ do ____	30,431	34,003	36,884
Residual fuel oil ____ do ____	44,366	48,746	53,957
Lubricants ____ do ____	2,507	2,511	2,579
Asphalt ____ do ____	5,012	5,420	6,311
Total [4] ____ do ____	105,578	115,173	124,665

e Estimate. p Preliminary. r Revised.

[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 includes "roasted ore;" presumably roasted pyrite.

[3] Revised to none.

[4] Total of reported figures only; no estimates have been made for unreported products and/or refinery fuel and losses.

TRADE

In 1975, East Germany's foreign trade increased about 7% in volume and about 16% in value. In 1974, 68.4% of trade was with other centrally planned economy countries, 27.4% with market economy countries, and 4.2% with developing countries.

East Germany's limited mineral exports in 1975 consisted mainly of brown coal briquets, potash, salt, and iron and steel semimanufactures.

Since East Germany is poor in raw materials, it has to rely a great deal upon imports. At present, the Soviet Union supplies 97% of East Germany's iron ore, about 40% of its pig iron and rolled steel, almost 98% of its crude oil, and 40% of its natural gas. Nonferrous metals imported from the Soviet Union cover from 60% to 70% of demand. In return for the raw materials, East Germany is helping build projects in the U.S.S.R. such as the Orenburg gas pipeline, the Kiyembay asbestos complex, the Ust-Ilimsk pulp and paper complex, and several oil-refining complexes. East Germany also is helping in the development of some iron ore deposits.

East Germany's trade with West Germany reached a record level in 1975 with a total of 7.3 billion marks representing a 0.5 billion mark increase over that of 1974. Imports from West Germany increased 7%, and the exports increased 3%.

An agreement was signed in 1975 between East Germany and Peru for Peruvian mineral sales, which included refined and blister copper and refined silver and zinc totaling approximately $15 million.

Table 2.—East Germany: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal destinations, 1974
METALS			
Aluminum:			
Oxide and hydroxide	3,062	2,994	All to Finland.
Metal including alloys:			
Scrap	7,651	1,397	Netherlands 1,138; Sweden 155.
Unwrought	3,485	1,291	Mainly to Italy.
Semimanufactures [3]	1,413	8,697	Poland 8,634.
Chromite	5,141	NA	
Copper metal including alloys:			
Scrap	157	NA	
Unwrought	211	377	France 250; United Kingdom 108.
Semimanufactures	47	259	Poland 202; Austria 40.
Iron and steel:			
Ore and concentrate thousand tons	--	2	All to Belgium-Luxembourg.
Scrap do	20	40	Poland 14; Italy 10; Sweden 5.
Pig iron, ferroalloys and similar materials do	2,042	165	Japan 129; Poland 20.
Steel, primary forms do	115	106	Italy 45; Belgium-Luxembourg 27; Yugoslavia 22.
Steel semimanufactures [3 4] do	r 221	229	Poland 85; Yugoslavia 41; Bulgaria 25.
Lead:			
Oxides	1,115	794	France 525; Denmark 155; Sweden 114.
Metal including alloys:			
Scrap	316	150	All to United Kingdom.
Unwrought and semimanufactures	4,540	2,373	Austria 1,749; Spain 400.
Magnesium metal including alloys, all forms	NA	57	All to United Kingdom.
Nickel metal including alloys	39	224	All to Netherlands.
Platinum-group metals and silver:			
Platinum group value, thousands	$70	NA	
Silver do	$448	$6,468	United Kingdom $5,525; Netherlands $943.
Tin metal including alloys, all forms	NA	7	All to United Kingdom.
Zinc:			
Oxides	1,525	1,372	Norway 1,042; Denmark 190; France 140.
Metal including alloys:			
Scrap	2,113	946	Belgium-Luxembourg 419; France 390; Sweden 95.
Unwrought and semimanufactures	1,515	408	United Kingdom 157; Belgium-Luxembourg 151, France 100.
Other:			
Ash and residue containing nonferrous metals	16,834	17,319	Austria 13,065; Netherlands 3,875.
Base metals including alloys, all forms, n.e.s	--	18	Belgium-Luxembourg 11; Sweden 7.

See footnotes at end of table.

Table 2.—East Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal destinations, 1974
NONMETALS			
Abrasives, grinding and polishing wheels and stones	NA	45	All to Greece.
Asbestos	--	100	All to Italy.
Barite [3]	9,996	3,185	Poland 3,045.
Cement [5] ---thousand tons	8	39	All to Hungary.
Chalk [6]	45,148	42,103	NA.
Clays and clay products:			
Kaolin [6]	90,459	95,443	NA.
Products:			
Nonrefractory	7,831	7,606	Belgium-Luxembourg 3,142; Denmark 2,257; Switzerland 760.
Refractory	r 9,395	6,800	Sweden 2,632; Belgium-Luxembourg 2,512; Norway 638.
Diamond, industrial ---value, thousands	$147	$365	All to Belgium-Luxembourg.
Feldspar and fluorspar	37,434	21,138	Norway 7,001; Austria 6,836; Yugoslavia 3,392.
Fertilizer materials:			
Crude ---thousand tons	--	46	Austria 22; United Kingdom 22.
Manufactured:			
Nitrogenous, manufactured [3] ---do	6,031	61	All to Hungary.
Potassic, crude and manufactured, K_2O equivalent [6] ---do	1,819	2,089	Czechoslovakia 469; Hungary 386; United Kingdom 276.
Phosphatic, manufactured (gross weight) ---do	6	2	All to Netherlands.
Ammonia ---do	--	55	Denmark 24; Sweden 20; France 11.
Gypsum, calcined [6]	r 84,686	139,652	NA.
Mica, worked	NA	6	All to Belgium-Luxembourg.
Salt, rock [6] ---thousand tons	879	945	Sweden 71.
Sodium and potassium compounds, n.e.s.:			
Caustic soda [5]	599	5,672	All to Hungary.
Caustic potash [6]	9,643	11,078	U.S.S.R. 1,296; Yugoslavia 1,199.
Soda ash [6] ---thousand tons	r 256	268	Czechoslovakia 60.
Stone, sand and gravel:			
Dimension stone, crude and partly worked	NA	666	Norway 552; Denmark 114.
Gravel and crushed rock:			
Gravel [6] ---thousand tons	680	354	NA.
Crushed rock [6] ---do	205	12	NA.
Sand, excluding metal bearing ---do	NA	17,358	Austria 11,494; Yugoslavia 5,864.
Sulfur:			
Elemental ---do	--	1	All to United Kingdom.
Sulfuric acid	--	12	All to Yugoslavia.
Other:			
Oxides of strontium, barium and magnesium	225	975	Sweden 350; Finland 265; Norway 180.
Nonmetals, n.e.s	13,424	8,886	All to United Kingdom.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [6]	10,300	8,000	United Kingdom 1,201; U.S.S.R. 1,000; Bulgaria 922.
Coal, brown coal briquets [6] ---thousand tons	2,255	2,551	Hungary 1,136; Czechoslovakia 546; Poland 296.
Coke	NA	3,415	Belgium-Luxembourg 2,766; Sweden 649.
Gas (natural or manufactured, unspecified) million cubic feet [6]	802	1,031	NA.
Petroleum refinery products:			
Gasoline [6] ---thousand 42-gallon barrels	6,352	5,242	NA.
Distillate fuel oil [6] ---do	5,056	8,346	NA.
Residual fuel oil ---do	443	1,229	Austria 517; Sweden 340; Denmark 320.
Lubricants ---do	24	58	Austria 42; Yugoslavia 8; United Kingdom 7.
Mineral jelly and wax [6] ---do	521	492	NA.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	2,957	3,214	France 1,243; Switzerland 1,225; Netherlands 369.

r Revised. NA Not available.

[1] Compiled from the 1973 edition of the World Trade Annual, vs. 1-3, Walker and Co., New York, 1975.

[2] Compiled from the 1974 edition of the Supplement to the World Trade Annual, Walker and Co., New York, 1976, unless otherwise specified.

[3] Source: Polish trade statistics.

[4] Source: Bulgarian trade statistics.

[5] Source: Hungarian trade statistics.

[6] Source: East German trade statistics.

Table 3.—East Germany: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal sources, 1974
METALS			
Aluminum:			
Bauxite [3] ---thousand tons--	r 246	248	Hungary 180; Yugoslavia 67.
Alumina, Al_2O_3 content [3]	83,467	92,908	NA.
Metal including alloys:			
Unwrought [4] [5]	114,232	134,963	U.S.S.R. 109,893; Yugoslavia 24,860.
Semimanufactures [3]	29,000	50,000	Hungary 5,693.
Cadmium metal including alloys [4]	193	166	All from U.S.S.R.
Chromium, chromite, Cr_2O_3 content [3]	39,100	44,000	U.S.S.R. 30,000.
Copper:			
Ore and concentrate	17,677	9,276	Mainly from Sweden.
Metal including alloys:			
Scrap	266	451	United States 135; Belgium-Luxembourg 135.
Unwrought	2,650	1,173	Norway 720; Yugoslavia 363.
Semimanufactures	333	414	Austria 218; United Kingdom 113; Sweden 72.
Iron and steel:			
Iron ore, iron content [3] --thousand tons--	1,775	1,802	Mainly from U.S.S.R.
Scrap [4] ---do---	320	238	Do.
Pig iron [3] ---do---	814	813	Do.
Ferroalloys [3] ---do---	17	28	U.S.S.R. 9.
Steel, primary forms ---do---	NA	65	Japan 47; France 11.
Semimanufactures: [3]			
Bars and rods ---do---	639	718	NA.
Angles, shapes, sections ---do---	475	510	NA.
Hot and cold rolled strip ---do---	297	310	NA.
Light plates and sheets ---do---	60	76	NA.
Heavy plates and sheets ---do---	552	520	NA.
Pipes ---do---	298	335	NA.
Rails and accessories ---do---	344	NA	
Lead:			
Oxide and hydroxide	NA	717	All from Austria.
Metal, unwrought and semimanufactures [4]	47,430	52,967	U.S.S.R. 45,408.
Magnesium, unwrought, unalloyed [4]	3,004	3,964	All from U.S.S.R.
Manganese ore:			
Metallurgical grade [4] ---thousand tons--	165	150	Do.
Battery and chemical grade [4] ---do---	2	--	
Mercury ---76-pound flasks--	4,641	4,293	All from Italy.
Nickel metal, all forms	NA	70	United Kingdom 39; Sweden 31.
Platinum, unworked ---value, thousands--	NA	$1,190	Mainly from United Kingdom.
Silver, unworked or partly worked ---do---	$6,160	$15,896	Do.
Tin metal including alloys, unwrought	NA	107	All from United Kingdom.
Titanium oxide	9,635	7,684	All from Yugoslavia.
Tungsten:			
Ore and concentrate	NA	148	United States 125; Netherlands 19.
Metal	3	2	All from Austria.
Zinc:			
Oxide	300	NA	
Metal including alloys, all forms [4]	42,006	46,254	U.S.S.R. 44,263.
Other:			
Ores and concentrates of molybdenum, tantalum, titanium, vanadium, zirconium	332	883	All from Netherlands.
Ash and residues containing nonferrous metals	NA	10,935	All from Spain.
Metal including alloys, all forms:			
Metalloids ---value, thousands--	NA	$73	Mainly from Denmark.
Base metals and alloys, n.e.s	174	219	Mainly from Belgium-Luxembourg.
NONMETALS			
Abrasives, natural:			
Dust and powder of precious and semiprecious stones, except diamond value, thousands--	r $52	$29	NA.
Grinding wheels and stones	152	205	Austria 111; Sweden 91.
Asbestos [3]	51,691	56,318	U.S.S.R. 44,731.
Cement	132,522	NA	

See footnotes at end of table.

Table 3.—East Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal sources, 1974
NONMETALS—Continued			
Clays and clay products:			
Crude clays:			
Bentonite [5]	16,117	15,643	All from Hungary.
Kaolin [3]	25,894	28,873	United Kingdom 16,488; Hungary 2,665.
Other	14,904	NA	
Products:			
Nonrefractory	NA	752	All from Belgium-Luxembourg.
Refractory	3,841	6,033	United Kingdom 2,823; Yugoslavia 1,156; France 909.
Diamond:			
Industrial ____value, thousands	$1,743	$960	All from Belgium-Luxembourg.
Gem ____do	$78	$633	Belgium-Luxembourg $562; United Kingdom $71.
Feldspar and fluorspar	20,963	25,339	Norway 14,922; Sweden 7,650.
Fertilizer materials:			
Crude, phosphate rock and apatite concentrates, P_2O_5 content [3] thousand tons	500	528	NA.
Manufactured:			
Nitrogenous, N content [3] ____do	237	194	Netherlands 18.
Phosphatic, P_2O_5 content [3] ____do	47	67	Mainly from Denmark.
Ammonia	1,496	NA	
Graphite [3]	5,376	5,173	NA.
Lime [6]	1,582	1,702	All from Poland.
Magnesite, crude, calcined and sintered [7] thousand tons	26	47	Czechoslovakia 44.
Mica [3]	1,490	2,907	NA.
Pigments, mineral, including processed iron oxides	531	70	All from Belgium-Luxembourg.
Pyrite [4]	164	144	All from U.S.S.R.
Quartz and quartzite, natural	--	519	All from Sweden.
Stone, sand and gravel	480	10,512	Yugoslavia 7,058; France 1,495; Finland 1,452.
Sulfur:			
Elemental, all forms [3]	62,000	128,000	All from Poland.
Sulfuric acid [6]	40,901	56,942	Do.
Talc and related materials	1,623	2,362	All from Austria.
Other:			
Slag, dross, and similar waste	NA	56,166	Mainly from Sweden.
Other nonmetallic minerals, n.e.s	636	NA	
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [3]	29,200	32,100	U.S.S.R. 22,933.
Coal:			
Anthracite and bituminous [3] thousand tons	8,341	7,200	U.S.S.R. 4,119; Poland 1,972; Czechoslovakia 710.
Lignite [6] ____do	5,022	5,198	All from Poland.
Coke [3] ____do	3,199	3,042	U.S.S.R. 1,036; Poland 851; Czechoslovakia 801.
Gas, manufactured [3] ____million cubic feet	27,909	100,339	NA.
Petroleum:			
Crude [3] ____thousand 42-gallon barrels	117,846	106,051	U.S.S.R. 106,016.
Refinery products:			
Gasoline ____do	10	168	Mainly from Spain.
Kerosine ____do	NA	10	All from Yugoslavia.
Distillate fuel oil ____do	240	99	Belgium-Luxembourg 79; Italy 20.
Lubricants ____do	99	1	Mainly from Netherlands.
Other, coke ____do	28	NA	
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals [4]	66,481	62,334	All from U.S.S.R.

[r] Revised. NA Not available.
[1] Compiled from the 1973 edition of the World Trade Annual, vs. 1–3, Walker and Co., New York, 1975.
[2] Compiled from the 1974 edition of the Supplement to the World Trade Annual, Walker and Co., New York, 1976, unless otherwise specified.
[3] Source: East German trade statistics.
[4] Source: Trade statistics of the U.S.S.R.
[5] Source: Hungarian trade statistics.
[6] Source: Polish trade statistics.
[7] Source: Trade statistics of Czechoslovakia.

COMMODITY REVIEW

METALS

Aluminum.—In 1975, as in previous years, East Germany imported all of its bauxite and some of its alumina requirements. The domestic consumption of aluminum is estimated at 190,000 tons per year for the last 2 years; the output of primary metal remained approximately 70,000 tons. In the last 2 years, 110,000 tons of aluminum was imported from the U.S.S.R. per year.

The VEB Chemiewerke Lauta is East Germany's only alumina plant and has a capacity of 70,000 tons per year. The plant produced an estimated 48,300 tons in 1975. Primary aluminum is produced at the VEB Elektrochemiches Kombinat in Bitterfeld with a capacity of 65,000 tons per year and at the Aluminumwerke Lauta in Lauta with a capacity of 25,000 tons per year.

Copper.—East Germany's primary copper production has virtually come to a standstill. The copper deposits at Mansfeld-Eisleben-Hettstedt are almost depleted, and the mines were closed in 1974. However, a new deposit is being developed at nearby Sangerhausen. Refined copper output was estimated at 48,000 tons for 1975. East Germany does not publish its copper imports or production but, as in the past, most of the copper was imported from the Soviet Union.

Iron and Steel.—In 1975, East Germany produced 6,472,000 tons of crude steel, 2,456,000 tons of pig iron, 4,281,000 tons of steel semimanufactures, and 50,000 tons of iron ore. Production of crude steel increased 5.0% over that of 1974, that of pig iron, 7.7%, and that of semimanufactures, 4.4% for the same period. Iron ore resources in East Germany are almost depleted, and production figures are no longer reported by German sources. Production of steel and pig iron is also inadequate to satisfy domestic demand and, therefore, East Germany must rely upon large quantities of imports of these commodities. About 97% of the iron ore, and 40% of the pig iron and rolled steel are imported from the Soviet Union.[7]

The increase in East Germany's crude and rolled steel output in 1975 was mainly due to increased production in the VEB Stahl und Walzwerk at Brandenburg and in the VEB Maxhütte, Bergbau und Hüttenkombinat at Unterwellenborn. With reconstruction of the open hearth at Brandenburg, the plant's crude steel output reached more than 2 million tons per year.[8] At this plant, all 12 open-hearth furnaces were converted to natural gas.

The iron ore sintering plant built by Romanian engineers at Eisenhüttenstadt was working at 80% capacity after 2 months of production, which began in December 1975. The design capacity is 4 million tons of sinter. The project was designed by the Institute for Metallurgical Plants and Factories of Bucharest.

An agreement was signed in April 1975 between the West German firm Fried. Krupp GmbH and the East German trade firm Industrie-Anlagen Import on expanding the Henningsdorf steelworks located west of Berlin. The principal item in the reconstruction was a high-performance electric arc furnace. The project's total cost will be approximately 120 million marks. Construction was scheduled to begin at yearend 1976 and is to be completed in 1978.

Tin.—Estimated tin production for 1975 remained unchanged from the previous 2 years at 1,200 tons for both mine output and refined tin output. At yearend 1975, a new plant at Freiberg started to process low-grade tin ores from the large tin ore deposit near Altenberg.

Uranium.—East Germany had substantial uranium deposits, which were estimated in 1961 at 100,000 tons of uranium metal (117,925 tons of U_3O_8).[9] Since the end of World War II, this uranium has probably been exported to the U.S.S.R. exclusively. The present estimated mining rate is approximately 2,000 tons per year. Elsewhere, production was reported at 5,000 tons per year, making East Germany probably the second largest uranium producer in the

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[7] Baumgart, G. Raw Materials are a Problem for Us Too. Neuer Tag (Frankfurt/Oder), March 1976, p. 6.

[8] Singhuber, K. Great Achievements of Metallurgical Workers. Presse-Informationen (East Berlin), Oct. 31, 1975, pp. 2–3.

[9] Analysis of Energy Resources and Programs of the Soviet Union and Eastern Europe. Technical Report RADC–TR–74–204, December 1973, pp. 57–77.

world, but this could not be confirmed.[10] Uranium deposits in the Erz Mountains are now almost depleted, but mining is active in the Thüringen region, near Gera, where uranium-bearing argillite contains about 0.1% U_3O_8. A third production center is the sedimentary deposit at Elbsandstein where underground mining is employed. Most of the uranium mining is being performed by the Wismut Sowjetisch-Deutsche Aktiengesellschaft (Soviet-German Company) (SDAG). Data on current East German uranium reserves and mining are nonexistent owing to the secrecy imposed upon the uranium industries of the centrally planned economy countries.

NONMETALS

Bromine.—East Germany's largest bromine factory began test operations in February 1975 at the VEB Karl Liebknecht potash plant located in Bleicherode. The planned total output for 1975 was to have been 700 tons of bromine.[11] In East Germany, bromine is obtained from bromide-containing lyes of the potash industry.

Cement.—Cement production was estimated at 10.7 million tons in 1975. Construction of the second production line at the VEB Eischsfelder Zementwerke Deuna plant near Erfurt was scheduled to be completed by yearend 1975. As soon as all four production lines are in operation, this plant is to produce a total of 2.5 million tons per year. Work continued on expansion of the Karsdorf cement works, which produced 4.3 million tons in 1975.

Fertilizer Materials.—The total estimated fertilizer production in 1975 was 4.0 million tons of nutrients[12] and showed an increase of 8.1% over that of 1974. Potassium fertilizers constituted 75% of the total production, nitrogen fertilizers represented 14%, and phosphorous fertilizers were 11%.

Nitrogen.—Nitrogen fertilizer production in 1975 was 539,000 tons (nitrogen content), 24% increase over that of 1974. In 1976, East Germany was planning to produce 745,000 tons of nitrogen fertilizers.

All three of the production plants of the VEB Stickstoffwerk Piesteritz have entered commercial operation. The first plant has a capacity of 345,000 tons per year of nitrogen fertilizer and plastics-grade urea and was constructed by Czechoslovakia. The second plant has a capacity of 450,000 tons per year of ammonia. This plant was designed by M. W. Kellogg Co. and constructed by the Toyo Engineering Co. The third plant has a capacity of 350,000 tons per year of urea. Between 80% and 90% of the urea produced at these new plants will probably be used for fertilizer purposes.[13]

East Germany, together with Bulgaria, Czechoslovakia, and Hungary, is to assist in the construction of the Kingisepp ammonium phosphate fertilizer plant in the U.S.S.R., located in Leningrad Oblast'. As payment for its participation, East Germany is to receive Soviet deliveries of ammonium phosphate over a period of 10 years beginning in 1976.

Phosphate.—Production of phosphatic fertilizers in 1975 was estimated at 427,000 tons (P_2O_5 content), an increase of 4% over that of 1974. East Germany has virtually no phosphatic raw materials and, therefore, must import most of its needs.

Potash.—East Germany remained the world's third leading producer of potash, representing one-eighth of the total output. Production reached 3.02 million tons of potash in 1975, a 5.4% increase over that of 1974. This increase was mainly due to the output from the Zielitz potassium combine. By 1980, potash production is to increase by 13% to 18%. In 1976, production is expected to reach 3.2 million tons.

In 1974, East Germany increased its potash exports by 15%, reaching a record 2.09 million tons and delivering 26% to Poland, 23% to Czechoslovakia, 8%, each to the United Kingdom and Hungary, and smaller amounts to Yugoslavia, Austria, India, Cuba, and Sri Lanka.

East Germany is trying to improve the yield of potash mines in order to reduce mining losses 10%. The increase in production is to be achieved by greater mechanization. Potash is now mined in underground mines almost exclusively with blasting and drilling, mostly with diesel-driven equipment. The material is moved by conveyor

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[10] Lang, G. Mining and Exploration of Uranium Ore: The European Scene. Glückauf (Essen), v. 112, No. 6, Mar. 18, 1976, pp. 276–280.

[11] Chemische Technik (Leipzig). V. 27, No. 6, June 1975, p. 374.

[12] The active ingredients (nitrogen, phosphate, and potash) are expressed as N, P_2O_5, and K_2O content, respectively.

[13] Nitrogen (London). No. 100, March–April 1976, p. 15.

belts.[14] The potash is processed by grinding, then separated either by froth flotation or by recrystallization. The country's present potash reserves were estimated at about 13 billion tons. The total work force of the potash industry was estimated at 33,000 in 1974.

The Werra potash enterprise at Merkers, which employs 8,600 workers, is building a bromine factory that will utilize the potash deposits. It is expected to produce enough bromine to cover domestic demand.

Potassium sulfate is now produced only at Dorndorf where there are no present plans for expansion.[15]

Beginning in 1976, the potassium salt plant at Zielitz, near Magdeburg, was to start producing approximately 900,000 tons of salts per year. This plant is being developed with the cooperation of the U.S.S.R., Poland, and Czechoslovakia.

Sulfur.—Sulfur in East Germany is recovered mostly as a byproduct of fuel processing.

Sulfuric acid turnkey plants, built by Polimex Cekop, Ltd., of Poland, are being established at VEB Fahlberg-List at Magdeburg (with a 100,000-ton-per-year capacity) and at VEB Seelingstadt (with a 200,000-ton-per-year capacity). The VEB Chemiewerk Nunchritz plant, which is presently under construction, is to have a 100,000-ton-per-year capacity and will receive liquid sulfur from Poland under a long-term agreement.[16]

MINERAL FUELS

East Germany's total primary energy consumption for 1975 reached an estimated 121.1 million tons of standard coal equivalent. This represented an increase of 0.3% over that of 1974. Coal provided 69.1% of the total primary energy while oil represented 17.6%, natural gas 12.3%, nuclear power 0.7%, hydroelectric power 0.2%, and imported electric power 0.1%.

In 1975, East Germany produced 71.7% of its primary energy consumption from domestic fossil fuels, hydroelectric power, and nuclear energy. It imported 33.4% of its primary energy production and exported 5.1%. Primary energy balances for East Germany for 1974 and 1975 are shown in table 4. In general, the total primary energy distribution for 1974 and 1975 did not show any significant changes.

Coal.—In 1975, East Germany produced approximately 29% of the world's lignite output. Nearly 700,000 tons per day was mined at the 37 open pit mines to produce a total of 247 million tons in 1975. The Cottbus region is the principal mining area and produces approximately 50% of the country's total output. This basin possesses

[14] Taubert, H. Potash and Salt Mining in the German Democratic Republic. Neue Bergbautechnik (Leipzig), v. 4, No. 1, January 1974, p. 8.
[15] Phosphorus and Potassium (London). No. 78, July–August 1975, p. 34.
[16] Sulphur (London). No. 120, September–October 1975, p. 17.

Table 4.—East Germany: Primary energy balance 1974–75
(Million tons of standard coal equivalent) [1]

	Total primary energy	Coal (lignite, brown, bituminous)	Crude oil and petroleum products	Natural and associated gas	Hydroelectric power	Nuclear power	Electric power
1974:							
Production [2]	85.8	73.6	0.5	10.6	0.2	0.9	--
Exports	4.7	1.8	2.8	--	--	--	0.1
Imports	39.7	11.5	24.2	3.8	--	--	.2
Apparent consumption	120.8	83.3	21.9	14.4	.2	.9	.1
1975:							
Production [2]	86.6	74.6	.5	10.6	.2	.9	--
Exports	6.1	1.6	4.4	--	--	--	.1
Imports	40.4	10.7	25.2	4.3	--	--	.2
Apparent consumption	121.1	83.7	21.3	14.9	.2	.9	.1

[1] 1 ton standard coal equivalent (SCE) = 7,000,000 kilocalories. Conversion factors used are hard coal, 1.0; lignite and brown coal, 0.3; crude oil, 1.47; natural gas, 1.33 (per thousand cubic meters); hydroelectric and nuclear power, 0.125 (per thousand kilowatt-hours).
[2] Taken from production table.
Source: World Energy Supplies, Statistical Papers, Ser. J, No. 18, (United Nations) New York, 1975.

two-thirds of East Germany's usable coal reserves, which amount to approximately 20 billion tons. The largest and most productive open pits are located here and employ the most modern equipment available. The rest of the lignite mining is done in the coal regions of Halle and Leipzig where 20 open pit mines are located.[17]

Lignite production is to increase to 250 million to 254 million tons by 1980 and to 270 million tons sometime thereafter. These high outputs can be maintained only with the replacement of depleted mines, intensification of existing open pits, fuller mechanization and development of 18 new large open pits in the Halle-Leipzig area and to the south of Cottbus.[18]

More than 80% of the electric power presently produced in East Germany is from lignite. Domestic lignite will continue to be the prime energy source; its share in 1980 is to be approximately 60%.

Future lignite mining in East Germany will encounter unfavorable geological and hydrological conditions and a greater amount of overburden will have to be removed. In 1975, the mining of 1 ton of lignite required moving 3.9 cubic meters of overburden; by 1980, this figure is expected to reach 4.5 cubic meters. Ratios of tons of lignite to cubic meters of overburden for the coming years will probably develop as follows: 1960, 1:2.8; 1975, 1:3.9; 1980, 1:45; 1985, 1:48; and 1990, 1:5.2.[19]

Deteriorating mining conditions are to be offset by more advanced open pit mining equipment and technology. By 1980, 76% of the overburden is to be removed by continuous systems including overburden conveyor bridges and belt conveyor systems. This figure is expected to increase to 85% in 1985.

More than 40% of the lignite is used for making briquets whose production reached 49 million tons in 1975. A total of 50 briquet plants, which are fairly evenly distributed over the Halle-Leipzig and Cottbus areas, produce approximately 50 million tons of briquets per year, 12 million of which go for public consumption. The Schwarze Pumpe Combine VEB, which is the most productive plant, has an output of 25,000 tons per day.

East and West Germany have signed an agreement on the mining of lignite deposits straddling the East German-West German border at Harbke and Helmstedt. The deposits are estimated to contain 15 million tons and extraction is to continue up to 1995. Approximately 5 million tons is in West German territory, and 10 million tons is in East Germany.

Natural Gas.—Natural gas production has maintained a level of 8 billion cubic meters for the past 2 years, and a considerable effort will be exerted to maintain this output in the future. Most of East Germany's recent natural gas production continues to come from the big discovery made in 1971 at the Salzwedel gasfields in the Magdeburg District near the West German border. In other parts of the country, a continuous effort is being made in order to find commercial reserves by deep drilling.

Soviet Union natural gas exports to East Germany were approximately 3 billion cubic meters in 1975. This export level is expected to increase to 7 billion cubic meters of gas in 1980.[20]

Work has begun on construction of the Orenburg gas pipeline in which East Germany is participating together with the other COMECON countries. This gas pipeline is to link the large deposit of natural gas at Orenburg, in the southern Ural mountains of the U.S.S.R., to the borders of East Europe. East Germany is responsible for construction of a 550-kilometer section of this pipeline, which lies in the Ukraine. By 1980, this pipeline is to supply East European countries with 15.5 billion cubic meters of gas per year. Each of the COMECON countries will receive deliveries of natural gas for a period of 12 years as payment for participation in the pipeline construction.

Petroleum.—Domestic crude oil production remained insignificant and as much as 98% of the national supply had to be imported. East Germany is the second largest importer of Soviet crude oil, with an estimated 15 million tons obtained in 1975. Deliveries of Soviet crude have been flowing through the 3,007-kilometer-long "Friend-

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[17] Friedrich, N. Less Waste in Brown Coal Mining With New Detection Device. Press-Informationen (East Berlin), Feb. 17, 1976, pp. 4–5.

[18] Koziol, G., K. Strzodka, and G. Eidner. State and Development of Modern Openpit Mining Technologies in the G.D.R. Ninth World Min. Cong. (Düsseldorf), May 1976, Paper III–22, pp. 1–10.

[19] Work cited in footnote 7.

[20] Szyndizielorz, K. Transgaz for 37 Billions. Polityka (Warsaw), May 3, 1975, p. 13.

ship" oil pipeline from Almeteevsk to East Germany since December 1963.[21]

Oil refining in East Germany had increased to 17 million tons in 1975, with an especially steep rise in consumption occurring during the period of the last 5-year plan.[22] The new 5-year plan calls for an increase of oil refining to 22.5 million to 23 million tons by 1980.

An extensive drilling campaign had been carried out in spite of past failures in order to find sizable crude oil reserves. Plans were made for offshore drilling in the Baltic Sea with the cooperation of Poland and the U.S.S.R.

Nuclear Power.—In 1975, East Germany had two operating nuclear powerplants. The Rheinsberg nuclear powerplant, located approximately 100 kilometers north of Berlin, has been operating since 1966 at 70-megawatt capacity. The second nuclear powerplant is the Bruno Leuschner Nord near Greifswald, on which construction started in 1967. It had its first 440-megawatt block go into operation in December 1973 and the second block a year later. The second stage of this powerplant is presently under construction and is comprised of two 440-megawatt blocks similar to those now in operation.[23] The present share of electric energy supplied by nuclear power, is approximately 9%.

A third nuclear powerplant, to be located near Magdeburg, is still in the planning stage. The nuclear powerplants were built with very close cooperation of the Soviet Union, which has provided much of the equipment, blueprints, and technology.

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[21] Presse-Informationen (East Berlin). Mar. 25, 1976, pp. 5–6.

[22] Neuer Tag (Frankfurt/Oder), Feb. 12, 1976, p. 6.

[23] Mittsinger, V. Cooperation of the COMECON Countries in the Development of Nuclear Power in the G.D.R. Ekonomicheskoye sotrudnichestvo stran-chlenov SEV (Economic Collaboration of COMECON countries), Moscow, No. 5, 1975, pp. 25–30.

The Mineral Industry of the Federal Republic of Germany

By Joseph B. Huvos [1]

In 1975, the Federal Republic of Germany was one of the world's major processors of minerals and concentrates. Only coal and potash, however, were found domestically in plentiful supply; all other fuels and minerals had to be imported. The most important mineral products of the country and their approximate percentages of world totals were as follows: Coal, 4%; lignite, 15%; coke, 9%; fuel briquets, 7%; pig iron, 6%; crude steel, 0.5%; aluminum, 6%; potash, 9%; barite, 2%; salt, 5%; and cement, 5%.

In 1975, the Federal Republic of Germany's gross national product (GNP) was about $423 billion.[2] The contribution of the minerals industry to the GNP was about 11% of the total. The contribution of the main sectors of the mineral industry to the GNP in 1974 and 1975 and average employment in 1975 are shown in table 1.

[1] Physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted to U.S. dollars, from Deutsche marks (Dm) at the rate of DM2.4005=US$1.00 for 1975 and DM2.5919=US$1.00 for 1974. Source of conversion rate for 1974 and 1975 was International Monetary Fund. Source of GNP was Statistisches Bundesamt (Wiesbaden), Wirtschaft und Statistik, v. 16, No. 2, 1976, p. 69.

Table 1.—Federal Republic of Germany: Employment in and contribution to gross product by the mineral industry

	Average 1975 employment (thousand persons)	Contribution to gross product [1] (Million dollars)		Change percent
		1974 [2]	1975 [3]	
MINING				
Iron ore	3	67	59	−11.9
Nonferrous metals	3	66	59	−10.6
Potash and salt	12	432	449	+3.9
Other nonmetallic minerals	1	23	21	−8.7
Coal	206	4,996	4,885	−2.2
Lignite	20	456	469	+2.9
Peat	3	72	86	+19.4
Oil and gas	6	1,039	1,109	+6.7
Total	254	7,151	7,137	−0.2
PROCESSING				
Iron and steel	311	18,162	16,429	−9.5
Nonferrous metals	83	5,502	4,374	−20.5
Stone and earths	194	7,699	7,614	−1.1
Petroleum refining	31	12,840	12,477	−2.8
Total	619	44,203	40,894	−7.5

[1] Includes production outside the territory of the Federal Republic of Germany; does not include value-added tax.

[2] Values have been converted from Deutsche marks to U.S. dollars at the rate of DM2.5919=US$1.00.

[3] Values have been converted from Deutsche marks to U.S. dollars at the rate of DM2.4605=US$1.00.

Source: Adapted from Statistisches Bundesamt (Wiesbaden), Wirtschaft und Statistik, v. 16, No. 2, 1976, pp. 82*–83*.

Depending on the commodities produced, companies in the Federal Republic of Germany's mineral industries were affected to varying degrees by the 1975 international recession and high oil prices. Among the hardest hit were the iron and steel industry, the nonferrous metals industry, cement, nitrogen compounds, bituminous coal mining, and petroleum refining. Production of sulfur and nuclear power, however, increased.

There were a number of significant developments in 1975. In the iron and steel industry the August Thyssen–Hütte AG (ATH) consolidated its leading position with the acquisition of Rheinstahl AG, Essen. In the petroleum industry, the Government-controlled VEBA AG and Gelsenberg AG continued integration of their petroleum operations. In the aluminum industry, the Hamburger Aluminium Werke GmbH transferred control of its Hamburg reduction plant to a group headed by Reynolds Aluminium Deutschland Inc. Kaiser Aluminium and Chemical Corp. AG took control of Kaiser-Preussag Aluminium Werke GmbH (KAPAL) fabricating plants.

Some of the more important plants commissioned in 1975 were ATH's two new 100,000-ton-per-year continuous steel casting plants located at Beckerwerth and Ruhrort near Duisburg, the Rheinisch-Westfälisches Elektrizitätswerk AG's 1,200-megawatt Biblis A nuclear powerplant, and the 8-million-ton-per-year Wilhelmshafen refinery of Mobil Oil AG.

Construction of the 115,000-ton-per-year coking plant of the Brikettfabrik Fortuna Nord at Niederaussem near Cologne was continued. Seven mines closed, including one potash, one lead-zinc, two iron, and three coal mines. An open hearth furnace and an oil refinery also shut down.

PRODUCTION

In 1975 production of most minerals and related products decreased owing to falling domestic and foreign demand. Production of selected mineral commodities in the Federal Republic of Germany in 1973, 1974, and 1975 is detailed in table 2.

Table 2.—Federal Republic of Germany: Production of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Aluminum:			
Bauxite, gross weight	1,642	1,407	755
Alumina ---- thousand tons	905	1,307	1,246
Metal:			
Primary ---- do	r 532	689	678
Secondary:			
Unalloyed ---- do	36	47	38
Alloyed ---- do	295	280	250
Bismuth:			
Ore and concentrate e	11	10	11
Metal, smelter e	400	450	600
Cadmium, smelter	1,221	1,338	1,018
Cobalt, smelter	370	356	340
Copper:			
Mine output, metal content	1,436	1,734	1,961
Metal:			
Blister and anodes:			
Primary	r 159,212	174,029	168,125
Secondary	r 73,274	70,642	47,722
Refined including secondary:			
Electrolytic	300,662	313,152	318,916
Fire, refined	105,996	110,409	103,286
Gold:			
Mine output, metal content ---- troy ounces	2,087	1,315	2,116
Metal including secondary ---- do	298,937	313,437	351,471
Iron and steel:			
Iron ore and concentrate ---- thousand tons	5,069	4,439	3,288
Pig iron and blast furnace ferroalloys ---- do	36,828	40,221	30,074
Electric furnace ferroalloys ---- do	265	283	257
Steel ingots and castings ---- do	49,521	53,232	40,415
Semimanufactures ---- do	r 36,150	38,858	28,873
Lead:			
Mine output, metal content	34,890	30,673	32,383
Metal, unalloyed:			
Primary	r 85,805	116,130	92,242
Secondary	r 216,772	205,272	167,924

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS—Continued			
Magnesium metal and alloys:			
Unwrought (secondary only) e	1,800	1,700	800
Castings	34,102	23,756	16,335
Mercury (secondary only) e ... 76-pound flasks	5,800	7,300	6,700
Molybdenum metal	263	186	179
Nickel including secondary [1]	125	146	122
Platinum ... troy ounces	4,340	4,115	3,601
Silver:			
Mine output, metal content ... thousand troy ounces	1,446	1,235	1,079
Metal including secondary ... do	20,821	23,586	20,417
Tin metal including secondary	2,142	2,528	2,332
Tungsten metal	1,609	1,513	894
Zinc:			
Mine output, metal content	122,843	116,622	116,072
Metal, unwrought, unalloyed, primary	142,016	134,383	e 130,000
NONMETALS			
Barite	330,034	306,395	254,902
Bromine, fluorine and iodine	4,638	5,304	4,270
Cement, hydraulic ... thousand tons	41,012	35,977	33,516
Chalk ... do	256	259	NA
Clays:			
Fire clay (exclusive of klebsand) ... do	5,319	5,218	4,525
Kaolin (marketable) ... do	488	496	419
Bleaching ... do	636	723	599
Other (schieferton) ... do	125	89	90
Corundum, artificial ... do	98	101	81
Diatomite and similar earth (marketable)	r 52,516	47,743	54,630
Feldspar (marketable)	355,791	374,844	395,833
Fertilizers:			
Crude:			
Phosphate rock ... thousand tons	93	85	81
Potassic:			
Gross weight ... do	24,950	26,202	22,006
K_2O equivalent ... do	2,975	3,090	2,607
Manufactured:			
Nitrogenous (nitrogen content):			
Nitrogen fertilizers ... do	1,006	1,104	1,065
Mixed fertilizers ... do	453	460	387
Total ... do	1,459	1,564	1,452
Phosphatic (P_2O_5 content):			
Superphosphate ... do	48	60	43
Thomas slag fertilizers ... do	264	242	185
Other phosphatic fertilizers ... do	227	205	135
Mixed fertilizers ... do	447	448	378
Total ... do	986	955	741
Potassic, K_2O equivalent:			
Marketable crude ... do	r 57	58	60
Chemically processed ... do	r 2,491	2,562	2,163
Total ... do	2,548	2,620	2,223
Content of mixed fertilizers [2] ... do	446	488	404
Mixed fertilizers, gross weight ... do	3,099	3,214	2,673
Fluorspar (marketable):			
Acid grade e	82,191	72,762	66,625
Metallurgical grade e	9,890	8,756	8,017
Total	92,081	81,518	74,642
Graphite:			
Crude	18,561	19,350	23,546
Marketable [3]	13,525	16,485	13,557
Gypsum and anhydrite, marketable ... thousand tons	2,948	2,302	2,084
Lime, quicklime and hydrated lime, including dead-burned dolomite ... do	11,236	11,211	9,175
Pigments, natural mineral ... do	20	18	18
Pumice:			
Crude and washed ... do	7,035	4,822	3,584
Marketable ... do	3,794	2,101	1,915
Pyrite (marketable concentrate):			
Gross weight ... do	428	477	492
Sulfur content ... do	192	214	221

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Quartz, quartzite, glass sand:			
Quartzite thousand tons	258	320	384
Quartz sand do	539	473	402
Quartz sand (unground) and glass sand do	7,076	7,301	5,669
Salt (marketable):			
Rock do	6,564	6,982	5,379
Marine and other do	3,637	4,338	3,937
Stone, sand and gravel, n.e.s.:			
Dimension stone thousand cubic meters	295	242	210
Limestone, industrial thousand tons	75,384	59,144	52,574
Crushed and broken do	r 119,139	124,376	113,115
Slate: [4]			
Roofing for office and industry do	12	11	NA
Splittings and ground do	55	NA	NA
Basalt lava and lava sand do	7,477	6,597	6,894
Calcite do	20	22	7
Grinding stone cubic meters	65	59	NA
Tuff thousand tons	1	2	3
Industrial sands:			
Molding sand do	1,169	1,155	1,007
Other (klebsand) do	172	197	140
Sand and gravel do	206,860	183,946	171,476
Sulfur, elemental byproduct do	333	429	521
Talc including talc schist do	28	30	21
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	290,546	299,668	260,992
Coal:			
Anthracite thousand tons	6,763	7,384	7,650
Bituminous do	90,576	87,492	84,743
Lignite do	118,658	126,044	123,377
Total do	215,997	220,920	215,770
Coke:			
Metallurgical do	33,997	34,960	34,815
Gashouse do	1,547	1,544	1,243
Total do	35,544	36,504	36,058
Fuel briquets:			
Anthracite and bituminous do	2,271	2,249	1,697
Lignite do	6,487	6,326	4,984
Gas:			
Manufactured gas (excluding that from petroleum refineries):			
Blast furnace gas million cubic feet	517,251	544,761	362,689
Coke oven gas [5] do	544,973	562,454	564,806
Other gas do	179,927	155,631	90,946
Total do	1,242,151	1,262,846	1,018,441
Natural:			
Gross production do	706,131	734,787	645,445
Marketable production do	r 705,895	713,202	639,414
Peat:			
Agricultural use thousand tons	r 1,759	1,871	1,950
Fuel use do	279	187	226
Petroleum:			
Crude thousand 42-gallon barrels	47,944	44,718	41,470
Refinery products:			
Gasoline, aviation and motor do	121,803	163,944	115,378
Jet fuel do	12,544	12,365	11,789
Kerosine do	1,251	529	257
Distillate fuel oil do	321,551	307,810	269,543
Residual fuel oil do	231,117	210,135	144,088
Lubricants do	6,918	8,787	8,444
Other:			
Liquefied petroleum gas do	29,155	32,511	26,498
Bitumen do	27,574	27,479	24,274
Unspecified do	62,635	45,772	90,132
Refinery fuel and losses do	44,547	40,185	35,762
Total do	859,095	849,517	726,165

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 would result in double counting.

[3] Produced in part from imported crude graphite.

[4] Exclusive of slate recovered from mine dumps.

[5] Includes water gas and generator gas from coke ovens.

TRADE

In 1975 the Federal Republic of Germany traded with 151 countries, although the bulk of trade was with the European Economic Community (EEC). Mineral commodities exported included petrochemicals, iron and steel including semifinished products, nonferrous metals including semifinished products, and petroleum products. Principal mineral commodities imported included crude oil, natural gas and petroleum products, nonferrous metals, iron and steel, iron ore, and minerals in that order. The Federal Republic of Germany's trade in 1973 and 1974 is shown in tables 3 and 4.

Table 3.—Federal Republic of Germany: Exports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite	6,360	1,255	Belgium-Luxembourg 919; Austria 196.
Alumina	109,935	245,379	Canada 80,724; Netherlands 34,106.
Aluminum hydroxide	105,864	123,398	Sweden 37,316; Netherlands 28,703.
Metal including alloys:			
Scrap	29,519	31,756	Italy 15,134; Netherlands 8,246; France 6,421.
Unwrought	104,580	174,309	Italy 46,314; France 38,897; Netherlands 26,625.
Semimanufactures	211,864	278,173	France 58,674; Netherlands 37,107; Belgium-Luxembourg 30,262.
Antimony:			
Ore and concentrate	29	55	Austria 45.
Metals including alloys, all forms	55	196	Belgium-Luxembourg 114; Netherlands 62.
Arsenic, hydroxide, acids	416	295	India 57; Netherlands 35.
Beryllium metal including alloys, all forms ... kilograms	136	(1)	(1)
Bismuth metal including alloys, all forms	316	274	United States 94; United Kingdom 66; Spain 34.
Cadmium metal including alloys, all forms	245	237	Brazil 9.
Chromium:			
Chromite	3,336	3,679	France 1,541; Austria 1,259.
Oxide and hydroxide	9,449	10,558	NA.
Metal including alloys, all forms	181	331	United States 106; Italy 71; Belgium-Luxembourg 70.
Cobalt:			
Oxide and hydroxide	27	56	Yugoslavia 18; United States 17.
Metal including alloys, all forms	205	286	United Kingdom 64; Sweden 34.
Columbium and tantalum metal including alloys, all forms:			
Columbium ... kilograms	7,609	11,959	Belgium-Luxembourg 9,037.
Tantalum ... do	36,970	59,281	NA.
Copper:			
Ore and concentrate	951	5,015	All to Yugoslavia.
Matte	1,042	--	
Copper sulfate	1,250	1,541	NA.
Metal including alloys:			
Scrap	38,015	41,790	Italy 17,974; Belgium-Luxembourg 8,011; Austria 4,939.
Unwrought:			
Blister	32,785	50,222	United Kingdom 27,970; Belgium-Luxembourg 14,959; Spain 6,916.
Refined	110,701	82,440	Austria 16,263; France 15,385; United Kingdom 9,130; Brazil 8,848.
Alloys	5,866	7,415	Italy 1,554; Austria 1,321; Netherlands 846; France 824.
Master alloys	1,026	1,024	Belgium-Luxembourg 630; France 215.
Semimanufactures	169,288	224,827	France 35,985; Netherlands 31,901.
Germanium metal including alloys, all forms ... kilograms	700	1,900	All to Belgium-Luxembourg.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Gold:			
Ashes, residue, scrap ---- kilograms --	2	(3)	NA.
Metal:			
Unwrought thousand troy ounces --	274	288	Israel 59; Switzerland 43; Italy 31; United States 28.
Semimanufactures ----- do ----	7,287	7,858	Sweden 1,937; Netherlands 1,560; France 1,029; Italy 898.
Iron and steel:			
Ore and concentrate ----------------	6,130	5,086	Czechoslovakia 293.
Roasted pyrite --------------------	192,019	195,784	Belgium-Luxembourg 140,459; France 20,696.
Metal:			
Scrap -------- thousand tons --	2,303	2,545	Italy 2,043.
Pig iron including cast iron ---------------- do ----	1,165	1,361	Italy 405; France 259.
Sponge iron, powder, shot ---------------- do ----	25	27	Netherlands 4; France 4; Italy 3.
Spiegeleisen ---------- do ----	2	4	France 3; Italy 1.
Ferroalloys:			
Ferrochrome ------ do ----	36	41	France 9; Belgium-Luxembourg 9; United States 6.
Ferromanganese --- do ----	47	79	Belgium-Luxembourg 27; France 19; Italy 10.
Ferronickel ----------------	167	147	Mainly to Belgium-Luxembourg.
Ferrosilicon thousand tons --	15	24	Italy 4; France 2; Netherlands 2.
Ferrosilicochrome -- do ----	2	1	Mainly to Belgium-Luxembourg.
Ferrosilicomanganese ------	955	1,213	Poland 418; Italy 307; Switzerland 142.
Other ---- thousand tons --	12	17	Italy 3; Austria 1; Belgium-Luxembourg 1.
Steel, primary forms -- do ----	2,654	2,622	France 513; Italy 313; Belgium-Luxembourg 314.
Semimanufactures:			
Bars, rods, angles, sections --------- do ----	4,081	6,086	France 957; United States 663.
Universals, plates, sheets ------------- do ----	6,150	7,898	United States 897; France 855; U.S.S.R. 821.
Hoop and strip ---- do ----	910	1,340	Netherlands 149; U.S.S.R. 149; France 134.
Rails and accessories do ----	160	210	Italy 65; Republic of South Africa 49; Netherlands 20.
Wire -------------- do ----	310	493	France 62; United States 54; Netherlands 53.
Tubes, pipes, fittings ---------- do ----	3,033	3,710	U.S.S.R. 706; Netherlands 701.
Castings and forgings, rough ----- do ----	90	102	Belgium-Luxembourg 27; France 18; Netherlands 10.
Lead:			
Ore and concentrate ---------------	654	3,689	Belgium-Luxembourg 3,688.
Oxides ----------------------------	10,364	10,404	Netherlands 4,277; Belgium-Luxembourg 1,171.
Metal including alloys:			
Scrap -------------------------	15,343	16,701	Belgium-Luxembourg 5,780; Netherlands 5,519; Italy 3,129.
Unwrought --------------------	65,870	87,749	Italy 45,275; France 10,603; Netherlands 9,312.
Semimanufactures -------------	8,233	11,474	Belgium-Luxembourg 1,908; Switzerland 1,545.
Magnesium:			
Oxides, hydroxides, peroxides ------	4,759	4,694	Italy 1,182; Austria 522.
Metal including alloys:			
Scrap -------------------------	2,283	3,268	Italy 1,035; United Kingdom 929; United States 632; Netherlands 565.
Unwrought --------------------	488	477	Switzerland 116; Austria 104; Norway 77; People's Republic of China 52.
Semimanufactures -------------	473	472	Austria 88; Sweden 84; Netherlands 54; Belgium-Luxembourg 51.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Manganese:			
Ore and concentrate	4,024	1,296	NA.
Oxides	3,502	3,321	France 76; Yugoslavia 60.
Metal	72	204	Yugoslavia 33; Netherlands 31; Italy 30; Belgium-Luxembourg 20.
Mercury ... 76-pound flasks	1,036	2,491	Belgium-Luxembourg 453; United Kingdom 400.
Molybdenum:			
Ore and concentrate	240	327	Belgium-Luxembourg 186; Czechoslovakia 67; Sweden 53.
Metal including alloys, all forms	292	769	Sweden 155; Italy 111; Netherlands 94; Brazil 89.
Nickel:			
Ore and concentrate	--	4	NA.
Matte and speiss	--	72	All to United States.
Metal including alloys:			
Scrap	2,242	3,788	Sweden 1,004; Netherlands 856; United Kingdom 630.
Unwrought	1,453	2,062	Netherlands 774; United States 235; Italy 215.
Semimanufactures	12,791	15,954	France 2,048; Italy 1,491; Netherlands 1,471.
Platinum-group metals and silver:			
Waste and sweepings . kilograms	55,235	14,955	Netherlands 12,183; Switzerland 2,416; United States 290.
Metals including alloys all forms:			
Platinum group thousand troy ounces	770	621	Switzerland 200; Italy 77; Netherlands 74.
Silver ... do	35,924	44,311	Italy 7,423; France 5,502; Sweden 4,460.
Tin:			
Ore and concentrate	--	7	NA.
Oxides	448	520	France 98; Brazil 66; Spain 60.
Metal including alloys:			
Scrap	80	246	Netherlands 170; United Kingdom 47.
Unwrought	1,549	1,607	Netherlands 819; France 250.
Semimanufactures	692	915	Belgium-Luxembourg 115; France 103.
Titanium:			
Ore and concentrate	565	1,044	France 410; Austria 215; Switzerland 191.
Oxides	53,773	62,651	Italy 7,243; Netherlands 6,483.
Metal including alloys, all forms	1,128	602	United States 222; United Kingdom 129; Sweden 104.
Tungsten:			
Ore and concentrate	335	141	Sweden 130; Netherlands 10.
Metal including alloys, all forms	586	20	Italy 4; France 2; Austria 2.
Uranium and thorium:			
Ores and concentrate	20	--	
Uranium, thorium, rare-earth compounds	753	700	United States 334; Japan 165; France 147.
Metal including alloys, all forms kilograms	15,900	6,000	France 1,000; Switzerland 700.
Vanadium metal including alloys, all forms ... do	10,600	15,300	France 15,000.
Zinc:			
Ore and concentrates	82,187	76,116	Netherlands 44,044; Belgium-Luxembourg 25,464.
Oxide and peroxide	11,841	12,265	NA.
Metal including alloys:			
Scrap	9,827	12,194	Netherlands 6,918; Italy 2,261; France 1,656.
Dust	4,866	6,515	Netherlands 2,432; Belgium-Luxembourg 1,283.
Unwrought	110,274	81,457	Netherlands 16,077; Italy 12,371; United Kingdom 11,926; United States 11,214.
Semimanufactures	14,440	17,459	NA.
Zirconium metal including alloys, all forms	55	110	United States 59; Japan 18; Sweden 15.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Other:			
Ore and concentrate:			
Of columbium, tantalum, vanadium, zirconium	3,057	2,945	Italy 532; United States 521; Austria 345; France 322.
Of base metals, n.e.s	2	7	United States 6.
Ash and residue containing nonferrous metals	169,772	227,554	Netherlands 77,549; Belgium-Luxembourg 60,754; France 50,583.
Oxides, hydroxides, peroxides of metals, n.e.s	10,086	9,346	Italy 1,136; France 982.
Metals including alloys, all forms:			
Metalloids:			
Arsenic and tellurium	12	25	Italy 13; Yugoslavia 7.
Selenium and phosphorus	13,876	9,874	NA.
Silicon	2,052	1,618	Netherlands 465; Switzerland 233.
Alkali, alkaline earth, rare-earth metals	48	75	Italy 49; Switzerland 15.
Base metals including alloys, all forms, n.e.s	446	654	United States 191; France 134; Japan 93; Norway 66.
NONMETALS			
Abrasives:			
Natural:			
Pumice, emery, natural corundum, etc	328,658	297,325	Netherlands 174,713; Belgium-Luxembourg 119,456.
Dust and powder of precious and semiprecious stones thousand carats	482	820	Greece 425; Netherlands 135; Belgium-Luxembourg 90.
Grinding and polishing wheels and stones	10,400	12,397	France 1,502; Netherlands 1,201.
Artificial:			
Corundum	37,631	43,927	Sweden 5,949; Netherlands 3,996.
Silicon carbide	13,266	11,829	NA.
Asbestos	23,237	57,148	France 11,925; Spain 11,907; Italy 6,492.
Barite and witherite	75,879	54,317	Netherlands 7,319; Sweden 3,963.
Boron materials:			
Crude and natural borates	12,110	20,338	Italy 7,671; Belgium-Luxembourg 4,669; Sweden 4,051.
Oxide and acid	222	334	Netherlands 77; Yugoslavia 29.
Bromine	333	162	Poland 79; Czechoslovakia 35; Netherlands 26.
Cement thousand tons	2,184	2,795	Netherlands 1,157; Poland 505.
Chalk	19,467	16,727	Sweden 6,946; Netherlands 6,630.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Fire clay thousand tons	328	341	Italy 112; Netherlands 78; France 47; Belgium-Luxembourg 41.
Kaolin do	101	132	Austria 34; Italy 27; France 19; Belgium-Luxembourg 16.
Kyanite, sillimanite, andalusite, mullite do	1	2	Italy 1.
Other do	897	1,016	Italy 447; Belgium-Luxembourg 202; Netherlands 146; France 144.
Products:			
Refractory (including nonclay bricks) do	731	926	France 222; Belgium-Luxembourg 157.
Nonrefractory do	652	660	France 181; Belgium-Luxembourg 140; Netherlands 115.
Diamond:			
Gem:			
Crude or rough cut thousand carats	10	10	NA.
Other do	75	75	France 25; Belgium-Luxembourg 20; Switzerland 15.
Industrial do	171	210	Netherlands 65; Ireland 55; Switzerland 50.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Diatomite and other infusorial earth	5,098	5,157	United Kingdom 1,484; Netherlands 857; Iran 732; Italy 676.
Feldspar, leucite, nepheline, and nepheline syenite	17,449	22,884	Italy 5,408; France 5,204; Belgium-Luxembourg 3,253; Czechoslovakia 2,862.
Fertilizer materials:			
Crude:			
Phosphatic	7,728	11,902	Hungary 7,900; Italy 1,250.
Potassic	41,258	43,117	Belgium-Luxembourg 33,035; Netherlands 5,355.
Manufactured:			
Nitrogenous thousand tons	1,294	1,579	Belgium-Luxembourg 432; United States 295.
Phosphatic:			
Thomas slag do	35	39	Brazil 16; Austria 16; Netherlands 7.
Other do	8	16	Brazil 7; Hungary 4; United States 3.
Potassic do	108	2,228	Belgium-Luxembourg 512; Denmark 189.
Mixed do	1,078	960	Denmark 109; France 85.
Ammonia, anhydrous do	32	71	Belgium-Luxembourg 30; France 19; Denmark 13; United Kingdom 8.
Fluorspar	17,391	15,907	Belgium-Luxembourg 4,890; Austria 4,746; Finland 3,049.
Graphite, natural	9,259	10,790	Italy 3,228; United States 2,332.
Gypsum and plasters	304,604	333,013	Netherlands 179,035; Switzerland 62,141; Belgium-Luxembourg 44,319.
Iodine	15	52	France 13; Netherlands 7; Italy 6.
Lime	550,453	567,090	Netherlands 464,077; Belgium-Luxembourg 45,554.
Lithium minerals	326	267	NA.
Magnesite	11,609	6,982	France 4,109; United Kingdom 452.
Mica:			
Crude including splittings and waste	832	912	Switzerland 310; Austria 151; Sweden 112; Yugoslavia 91.
Worked including agglomerated splittings	234	303	United Kingdom 83.
Pigments, mineral:			
Natural, crude	6,204	7,315	Netherlands 3,465; Belgium-Luxembourg 1,010; United States 851.
Iron oxide and hydroxide	138,028	152,013	France 22,302; United States 19,503.
Precious and semiprecious stones except diamond:			
Natural kilograms	214,856	176,613	Hong Kong 27,961; Italy 19,348.
Manufactured do	4,916	5,380	Italy 1,877; United States 1,740.
Pyrite (gross weight)	448	594	United Kingdom 299; Argentina 56.
Salt thousand tons	1,631	2,207	Belgium-Luxembourg 1,603; Sweden 308.
Sodium and potassium compounds, n.e.s.:			
Caustic soda do	699	518	Netherlands 125; Australia 74.
Caustic potash, sodic, potassic peroxide do	12	162	U.S.S.R. 36; Italy 16.
Stone, sand and gravel:			
Dimension stone:			
Crude or partly worked:			
Calcareous	3,968	3,109	Austria 483; Belgium-Luxembourg 432.
Slate	19,152	17,968	Netherlands 7,129; Belgium-Luxembourg 5,733; Denmark 3,021.
Other	366,820	267,311	Netherlands 192,282; Switzerland 52,562.
Worked:			
Building and monumental stone	16,579	17,429	Netherlands 4,631; Belgium-Luxembourg 4,492; France 4,210.
Paving and flagstone	28,656	26,592	Netherlands 13,068; Denmark 7,831; France 3,997.
Slate	812	825	Netherlands 394; Belgium-Luxembourg 203; Switzerland 157.
Dolomite	125,391	193,327	France 91,375; Netherlands 71,378; Belgium-Luxembourg 20,428.
Gravel and crushed rock thousand tons	11,060	11,241	Netherlands 8,814; Switzerland 1,262.
Limestone	158	155	Netherlands 130.

See footnote at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Stone, sand and gravel—Continued			
Quartz and quartzite:			
Quartz crystal ___ kilograms __	47	46	Italy 24; Austria 11.
Other	51,624	63,736	Austria 17,509; France 14,906; Belgium-Luxembourg 7,631.
Sand excluding metal bearing thousand tons __	6,894	7,704	Netherlands 6,486.
Sulfates natural, magnesium sulfate (Kieserite) ___ do ___	450	468	Netherlands 81; Norway 67; Sweden 46.
Elemental:			
Other than colloidal	66,752	140,526	Denmark 66,719; Switzerland 35,319; Austria 15,001.
Colloidal	4,347	3,756	United Kingdom 578; India 433; Republic of South Africa 376.
Sulfur dioxide	10,499	16,301	Sweden 9,629; Belgium-Luxembourg 3,238; Austria 1,951.
Sulfuric acid	563,062	427,349	Netherlands 118,705; Belgium-Luxembourg 111,159; France 105,883.
Talc, steatite, soapstone	5,557	7,115	Denmark 3,517.
Vermiculite, chlorite, perlite	440	639	Austria 396.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet kilograms __	2,800	1,700	NA.
Pottery	32,189	2,116	Netherlands 10,903; France 7,294; Belgium-Luxembourg 5,966; Austria 3,580.
Other ___ thousand tons __	530	889	Netherlands 735.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufactures ___ do ___	1,612	3,282	Netherlands 1,653.
Slag and ash, n.e.s ___ do ___	559	913	Netherlands 785; France 101.
Oxides and hydroxides of strontium and barium	4,013	5,804	France 2,074; United States 1,789; Belgium-Luxembourg 582.
Building materials of asphalt, asbestos and fiber cement, and unfired metals, n.e.s	113,944	150,944	France 57,516; Netherlands 34,683.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen natural	1,713	866	Switzerland 196; Austria 188; Italy 120.
Carbon black	89,260	94,385	Austria 14,944; France 12,192; Belgium-Luxembourg 11,477; Poland 10,368.
Coal and briquets:			
Anthracite and bituminous thousand tons __	13,856	17,444	France 6,620; Belgium-Luxembourg 4,838; Italy 3,373.
Briquets of anthracite and bituminous coal ___ do ___	216	239	Belgium-Luxembourg 74; Austria 50; United Kingdom 41; France 34.
Lignite and lignite briquets ___ do ___	601	680	France 249; Austria 171; Belgium-Luxembourg 84; Italy 78.
Coke and semicoke ___ do ___	10,262	13,082	Sweden 865; Netherlands 754; Romania 196.
Gas natural ___ do ___	272	299	Switzerland 133; Netherlands 47; Belgium-Luxembourg 41; Denmark 40.
Helium and other rare gases	17,437	23,135	France 12,195; Italy 4,739; Belgium-Luxembourg 2,829.
Peat and briquets ___ thousand tons __	313	337	Netherlands 177; Switzerland 59; France 41.
Petroleum refinery products:			
Gasoline, motor spirit thousand 42-gallon barrels __	9,478	7,747	Switzerland 3,105; Austria 1,798; Netherlands 1,185.
Kerosine white spirit ___ do ___	9,657	9,316	Denmark 779; United Kingdom 151.
Distillate fuel oil ___ do ___	16,516	13,495	Switzerland 4,813; Netherlands 2,342; Poland 1,334.

See footnote at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum refinery products—Continued			
Residual fuel oil thousand 42-gallon barrels	26,180	27,140	Denmark 2,759; Sweden 2,648; France 2,167.
Lubricants do	2,592	2,958	Belgium-Luxembourg 621; Sweden 411; United Kingdom 348.
Mineral jelly and wax do	1,077	1,186	Italy 130; Netherlands 97.
Other do	17,325	19,292	Netherlands 5,830; France 4,987.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons	221	359	Netherlands 208; Belgium-Luxembourg 56; France 41.

[r] Revised. NA Not available.
[1] Value only reported at US$57,873, of which an amount valued at $23,149 was shipped to the Netherlands.
[2] Excludes quantity valued at US$72,148, of which $46,298 was shipped to Belgium-Luxembourg.
[3] Less than ½ unit.

Table 4.—Federal Republic of Germany: Imports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite thousand tons	2,749	434	Guinea 47; Denmark 42.
Alumina	374,161	499,149	Surinam 145,776; Italy 139,522; Australia 139,219.
Aluminum hydroxide	2,596	1,570	United States 1,212; France 232.
Metal including alloys:			
Scrap	86,440	77,170	Netherlands 17,129; United States 9,853; Austria 8,851.
Unwrought	392,986	338,942	Norway 129,315; Netherlands 48,105; France 32,004.
Semimanufactures	162,272	144,955	France 43,924; Belgium-Luxembourg 37,658; Netherlands 27,446.
Antimony:			
Ore and concentrate	3,012	3,369	Turkey 2,090; Bolivia 932.
Metal including alloys, all forms	1,377	924	Belgium-Luxembourg 516; Italy 193.
Arsenic hydroxide	751	975	France 500; Belgium-Luxembourg 276; United States 121.
Beryllium metal including alloys, all forms kilograms	2,966	5,384	United States 4,663; Switzerland 465.
Bismuth metal including alloys, all forms	215	129	Japan 30; Netherlands 21.
Cadmium metal including alloys, all forms	1,249	1,094	Belgium-Luxembourg 280; U.S.S.R. 255; Japan 233; Bulgaria 108.
Chromium:			
Chromite	508,692	386,545	Republic of South Africa 175,586; U.S.S.R. 82,403; Turkey 55,980; Finland 35,787.
Oxide and hydroxide	2,556	1,309	U.S.S.R. 1,159.
Metal including alloys, all forms	292	551	France 183; Japan 164; United States 75.
Cobalt metal including alloys, all forms	1,681	1,956	Zaire 535; Belgium-Luxembourg 529; United States 475; Norway 191.
Columbium and tantalum metal including alloys, all forms:			
Columbium kilograms	4,504	6,349	United States 4,495; United Kingdom 1,300.
Tantalum do	98,145	89,107	United States 62,800.
Copper:			
Ore and concentrate	514,806	571,146	New Guinea 141,675; Chile 91,397; Republic of South Africa 68,112.
Matte	893	743	United Kingdom 384; Burma 349.
Copper sulfate	9,859	7,563	France 4,078; Belgium-Luxembourg 1,594.
Metal including alloys:			
Scrap	116,655	106,534	France 22,531; Netherlands 16,777; United States 11,728; United Kingdom 11,290.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Copper—Continued			
Metal including alloys—Continued			
Unwrought:			
Blister	121,169	98,160	Republic of South Africa 51,530; Peru 16,116; Chile 11,076.
Refined	401,792	440,025	Chile 87,115; Zambia 80,306; Belgium-Luxembourg 62,551.
Alloys	50,942	32,693	Romania 3,627; Poland 2,625; U.S.S.R. 2,373; Czechoslovakia 2,241.
Master alloys	1,688	1,500	United Kingdom 1,139.
Semimanufactures	117,506	674,602	Belgium-Luxembourg 106,651; Chile 98,462; Zambia 81,802.
Gold:			
Ashes, residue, and scrap kilograms	146,223	221,457	United States 102,625; Switzerland 26,609; Netherlands 23,743.
Metal:			
Unwrought thousand troy ounces	2,653	3,123	Switzerland 885; United States 677; United Kingdom 546; Republic of South Africa 494.
Semimanufactures do	123	166	Switzerland 76; United States 59; France 15.
Iron and steel:			
Ore and concentrate thousand tons	50,325	57,720	Sierra Leone 710; Republic of South Africa 659; India 563.
Roasted pyrite do	752	792	Spain 515; Belgium-Luxembourg 181.
Metal:			
Scrap do	1,480	1,811	Belgium-Luxembourg 342; France 264.
Pig iron including cast iron do	228	189	France 61; Netherlands 30; Norway 22.
Sponge iron, powder and shot do	37	40	France 13; United Kingdom 9.
Spiegeleisen	1,498	351	Belgium-Luxembourg 261; Italy 71.
Ferroalloys:			
Ferrochrome thousand tons	79	81	Republic of South Africa 40; Japan 7.
Ferromanganese do	182	167	France 68; Norway 58; Belgium-Luxembourg 22.
Ferronickel do	55	56	New Caledonia 26; Greece 19; Dominican Republic 5.
Ferrosilicon do	145	134	Norway 59; France 41.
Ferrosilicochrome do	20	22	Republic of South Africa 12; France 2.
Ferrosilicomanganese do	75	73	Norway 53; Czechoslovakia 8.
Other do	15	189	France 89; Belgium-Luxembourg 41.
Steel, primary forms do	2,296	2,035	Netherlands 507; Belgium-Luxembourg 502; Austria 245.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	3,178	2,528	France 562; Italy 140.
Universals, plates, sheets do	3,790	2,974	France 705; Austria 201.
Hoop and strip do	569	484	Belgium-Luxembourg 240; France 108; Netherlands 75.
Rails and accessories do	29	18	Netherlands 9; France 3; Belgium-Luxembourg 1.
Wire do	184	176	Belgium-Luxembourg 81; France 46; Czechoslovakia 18.
Tubes, pipes, fittings, do	617	558	Netherlands 169; France 81; Belgium-Luxembourg 74.
Castings and forgings, rough do	34	34	Romania 11; Netherlands 5; Belgium-Luxembourg 4.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Lead:			
Ore and concentrate	162,265	184,036	Sweden 38,415; Canada 31,433; Ireland 27,499; United States 19,528.
Oxides	4,362	4,994	Belgium-Luxembourg 3,234; Mexico 702; France 621.
Metal including alloys:			
Scrap	31,007	35,773	United Kingdom 13,493; Netherlands 7,440; United States 5,877; France 3,976.
Unwrought	136,143	128,693	United Kingdom 44,482; Australia 19,103; Sweden 18,008.
Semimanufactures	2,741	2,433	Belgium-Luxembourg 1,205; Yugoslavia 541.
Magnesium:			
Oxide, hydroxide, peroxide	6,859	6,417	United States 1,694; Netherlands 1,558; France 1,429; United Kingdom 647.
Metal including alloys:			
Scrap	4,216	1,450	Czechoslovakia 658; Netherlands 213; Austria 149.
Unwrought	45,031	37,405	Norway 15,793; United States 8,586; France 6,833; U.S.S.R. 5,578; Italy 4,906.
Semimanufactures	276	620	United States 496.
Manganese:			
Ore and concentrate thousand tons	716	828	Republic of South Africa 423; Australia 205; Brazil 142.
Oxides	2,148	2,061	Belgium-Luxembourg 1,479; Japan 323.
Metal	5,020	4,815	Republic of South Africa 1,771; France 1,548; Japan 648.
Mercury 76-pound flasks	19,380	12,151	Spain 7,005; Italy 2,022; U.S.S.R. 1,070.
Molybdenum:			
Ore and concentrate	18,725	17,556	United States 7,975; Netherlands 3,739; Chile 2,383.
Metal including alloys, all forms	421	372	Austria 212; United States 86; France 42.
Nickel:			
Ore and concentrate	20	--	
Matte and speiss	3,587	6,145	Canada 5,853.
Metal including alloys:			
Scrap	6,968	8,160	United Kingdom 1,741; United States 1,418; Belgium-Luxembourg 999.
Unwrought	34,469	44,306	United Kingdom 9,806; Australia 6,219; Norway 5,943; Republic of South Africa 5,461.
Semimanufactures	3,193	3,901	United Kingdom 1,065; Australia 942; United States 570; France 567.
Platinum-group metals and silver:			
Waste and sweepings kilograms	303,115	900,933	Netherlands 248,392; United Kingdom 162,186; Switzerland 148,054; United States 134,290.
Metals including alloys, all forms:			
Platinum group thousand troy ounces	723	861	U.S.S.R. 272; United Kingdom 267; United States 258.
Silver do	64,536	45,794	United Kingdom 8,579; Belgium-Luxembourg 6,255; France 4,135.
Tin:			
Ore and concentrate	8,817	10,816	Bolivia 7,395; Peru 3,356.
Oxides	162	108	Japan 41; France 36; Netherlands 17.
Scrap	246	385	Netherlands 142; Belgium-Luxembourg 80; United States 46; Switzerland 40.
Unwrought	16,161	17,785	Indonesia 5,262; Malaysia 2,900.
Semimanufactures	888	488	Netherlands 330; United Kingdom 89.
Titanium:			
Ore and concentrate	489,924	528,438	Norway 374,118; Australia 80,034; Canada 71,512.
Oxides	24,613	21,382	Belgium-Luxembourg 10,015; Netherlands 5,309; France 3,192.
Metal including alloys, all forms	3,070	3,807	U.S.S.R. 2,392; Japan 499; United States 395.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Tungsten:			
Ore and concentrate	6,886	4,246	France 1,166; Australia 50; People's Republic of China 46.
Metal including alloys, all forms	429	505	United States 95; Austria 82; Switzerland 72.
Uranium and thorium:			
Ore and concentrate	400	560	All from Australia.
Uranium, thorium, rare-earth compounds	713	939	France 359; United States 277; United Kingdom 162; Austria 124.
Metal including alloys, all forms kilograms	33,500	210	France 147; United Kingdom 59.
Vanadium metal including alloys, all forms	27	14	Belgium-Luxembourg 9; U.S.S.R. 5.
Zinc:			
Ore and concentrate	622,593	640,056	Canada 334,666; Sweden 74,870.
Oxide and peroxide	5,718	5,898	Netherlands 1,331; Canada 756.
Metal including alloys:			
Scrap	3,767	5,177	Denmark 1,684; Belgium-Luxembourg 750; United Kingdom 591.
Dust	12,486	12,928	Belgium-Luxembourg 12,128.
Unwrought	116,251	94,870	Belgium-Luxembourg 60,148; Netherlands 9,059.
Semimanufactures	22,827	18,220	Yugoslavia 3,625.
Zirconium metal including alloys, all forms	174	321	United States 216; France 88.
Other:			
Ore and concentrate:			
Of columbium, tantalum, vanadium, zirconium	43,438	26,537	Australia 17,549; Malaysia 2,389; Republic of South Africa 2,124.
Of base metals, n.e.s	1,839	3,279	Australia 3,092.
Ash and residue containing nonferrous metals	284,109	278,444	Canada 85,214; Italy 27,174.
Oxides, hydroxides, peroxides of metals, n.e.s	9,513	6,371	Belgium-Luxembourg 1,975; France 1,787; United Kingdom 653.
Metals, including alloys, all forms:			
Metalloids:			
Arsenic and tellurium	52	81	Sweden 34; U.S.S.R. 20; United States 14.
Selenium and phosphorus	24,496	25,726	NA.
Silicon	41,252	38,294	Norway 13,436; France 10,820; Switzerland 6,203.
Alkali, alkaline earth, rare-earth metals	960	337	France 197; Austria 87.
Pyrophoric alloys	74	30	United Kingdom 21; Denmark 2; France 2.
Base metals including alloys, all forms, n.e.s	467	353	France 74; Sweden 74; United States 73.
NONMETALS			
Abrasives:			
Natural:			
Pumice, emery, natural corundum, etc	176,712	74,259	Greece 45,960; Denmark 41,688; Italy 21,514; France 8,308; United States 7,959.
Dust and powder of precious and semiprecious stones thousand carats	6,479	7,279	United States 3,926; Ireland 2,179; Belgium-Luxembourg 444.
Grinding and polishing wheels and stones	5,867	6,211	Austria 1,294; Italy 1,253; Spain 757.
Artificial:			
Corundum	16,193	25,842	Netherlands 6,750; Hungary 4,124; Austria 4,045; France 2,647.
Silicon carbide	25,858	45,464	Netherlands 25,422; Norway 11,704.
Asbestos	332,707	399,561	Canada 308,128; U.S.S.R. 32,245.
Barite and witherite	128,686	165,336	NA.
Boron materials:			
Crude natural borates	154,849	194,426	Turkey 130,176; United States 62,913.
Oxide and acid	16,827	15,574	France 6,344; Turkey 3,090; United States 2,562; Italy 1,837.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Bromine	1,400	1,625	Israel 966; United Kingdom 417; France 240.
Cement ---- thousand tons	777	679	France 256; Belgium-Luxembourg 140; Netherlands 133; Sweden 85.
Chalk ---- do	82	85	France 81.
Clays and clay products (including all refractory brick):			
Crude clays:			
Fire clay ---- do	224	225	Czechoslovakia 95; Republic of South Africa 49; France 30.
Kaolin ---- do	714	768	United Kingdom 455; United States 116; Czechoslovakia 86; France 85.
Kyanite, sillimanite, andalusite, mullite ---- do	19	25	Republic of South Africa 9; India 5; United Kingdom 4; France 3.
Other ---- do	296	377	United States 102; Netherlands 74; France 56; Czechoslovakia 51.
Products:			
Refractory (including nonclay brick) ---- do	247	288	Austria 93; Czechoslovakia 57.
Nonrefractory ---- do	1,230	1,002	Netherlands 495; Italy 206.
Cryolite and chiolite	3,536	2,668	Denmark 2,603.
Diamond:			
Gem:			
Crude or rough cut thousand carats	130	100	NA.
Other ---- do	490	405	Belgium-Luxembourg 215; Israel 95.
Industrial ---- do	735	850	Belgium-Luxembourg 280; Netherlands 240; United States 225.
Diatomite and other infusorial earth	59,918	59,961	Denmark 41,688; France 8,298; United States 7,959.
Feldspar, leucite, nepheline, nepheline syenite	107,571	59,120	Norway 26,830; Italy 11,929; France 11,853.
Fertilizer materials:			
Crude:			
Nitrogenous	506	312	All from Chile.
Phosphatic ---- thousand tons	2,849	3,089	U.S.S.R. 901; Morocco 615.
Manufactured:			
Nitrogenous	774,826	639,019	Belgium-Luxembourg 273,817; Netherlands 136,959; Romania 62,675.
Phosphatic:			
Thomas slag	647,663	818,536	Belgium-Luxembourg 789,197.
Other	50,270	37,790	Belgium-Luxembourg 6,160; United States 4,685.
Potassic	82,676	84,281	France 66,274; Canada 17,981.
Mixed	231,927	331,515	France 187,753; United Kingdom 52,084; Netherlands 24,164.
Ammonia, anhydrous	220,780	157,315	France 105,199; Austria 34,679; Czechoslovakia 12,835.
Fluorspar	207,613	285,472	Spain 56,403; Italy 27,724.
Graphite, natural	22,199	26,787	Austria 5,234; People's Republic of China 4,730; Norway 3,240.
Gypsum and plasters	274,820	285,099	France 152,547; Austria 111,612.
Iodine	756	884	Japan 576; Chile 289.
Lime	165,310	183,585	France 173,612.
Lithium minerals	5,238	4,243	Republic of South Africa 3,321; United States 507.
Magnesite	352,246	435,577	Greece 163,289; Austria 59,088; North Korea 46,100.
Mica:			
Crude including splittings and waste	8,722	9,505	Spain 7,112; India 2,305; People's Republic of China 1,195; Argentina 1,321.
Worked including agglomerated splittings	613	654	France 347; Belgium-Luxembourg 147.
Pigments, mineral:			
Natural crude	1,946	1,883	Austria 1,459; Cyprus 217.
Iron oxides and hydroxides	1,872	2,385	France 904; Belgium-Luxembourg 336; United Kingdom 318.
Precious and semiprecious stones, except diamond:			
Natural	2,192	2,478	Brazil 1,614.
Manufactured	19	21	Switzerland 12; France 3; Japan 3; United States 2.

See footnote at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Pyrite (gross weight) thousand tons	892	780	U.S.S.R. 472; Norway 263.
Salt	748,748	777,476	Netherlands 641,306; France 83,525.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	r 53,295	50,092	Belgium-Luxembourg 32,783; Netherlands 7,522; Switzerland 5,349.
Caustic potash, sodic, potassic peroxides	498	2,210	Italy 493; Sweden 232.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	212,912	166,033	Austria 49,958; Italy 32,225; Portugal 19,559.
Slate	16,438	15,089	Spain 4,729; Portugal 3,062; United Kingdom 2,579.
Other	316,762	317,297	Denmark 56,430; Sweden 43,609; Austria 42,980; Norway 39,681.
Worked:			
Building and monumental stone	521,708	423,065	Italy 410,585.
Paving and flagstone	130,071	141,032	Portugal 83,540; Romania 20,271; Poland 15,904.
Slate	11,881	10,673	Italy 4,330; Spain 3,541.
Dolomite	830,232	934,624	Belgium-Luxembourg 854,778.
Gravel and crushed stone thousand tons	17,684	16,302	France 9,856; Denmark 3,030.
Limestone do	1,776	1,605	Austria 905; Sweden 292.
Quartz and quartzite:			
Quartz crystal kilograms	104	147	Japan 86; Switzerland 38.
Other	112,915	137,089	Belgium-Luxembourg 48,183; Netherlands 33,300; Sweden 21,899; Yugoslavia 19,492.
Sand, excluding metal bearing thousand tons	3,500	3,593	France 2,128; Belgium-Luxembourg 336.
Sulfates, natural, magnesium sulfate (Kieserite)	10	43	NA.
Sulfur:			
Elemental:			
Other than colloidal	490,311	471,836	Poland 246,260; United States 108,009; Canada 40,774.
Colloidal	276	229	France 200.
Sulfur dioxide	244	348	NA.
Sulfuric acid	105,386	180,360	Belgium-Luxembourg 59,227; Poland 26,438; France 20,602.
Talc, steatite, soapstone	101,726	210,359	Austria 36,120; France 19,014; Italy 16,713; Norway 10,125.
Vermiculite, chlorite, perlite	94,904	82,016	Greece 55,711; Hungary 12,274; Republic of South Africa 11,097.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet	6,498	7,159	Mainly from U.S.S.R.
Pottery	70,475	70,169	France 19,660; Netherlands 17,202; U.S.S.R. 9,783; Austria 7,864.
Other	374,310	423,189	France 182,217; Austria 86,052; Norway 73,136.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture thousand tons	1,608	1,158	France 558; Belgium-Luxembourg 510.
Slag and ash, n.e.s do	121	166	Belgium-Luxembourg 66; Czechoslovakia 44; Denmark 30.
Oxide and hydroxide of strontium and barium	470	585	Spain 350; Italy 86; France 71.
Building materials of asphalt, asbestos and fiber cement, and unfired metals, n.e.s	158,778	152,532	Belgium-Luxembourg 49,953.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	14,425	23,451	Trinidad and Tobago 17,833; United States 5,450.
Carbon black	44,623	36,296	Netherlands 16,190; United States 7,241; France 6,183.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coal and briquets:			
Anthracite and bituminous thousand tons	7,021	5,837	United Kingdom 472; Republic of South Africa 395; France 379; Netherlands 340.
Briquets of anthracite and bituminous coal do	86	14	France 10; Belgium-Luxembourg 3.
Lignite and lignite briquets do	1,253	1,349	Mainly from Austria.
Coke and semicoke do	1,281	1,288	United States 438; United Kingdom 215.
Gas, natural do	15,628	22,020	NA.
Helium and other rare gases	5,123	4,711	Belgium-Luxembourg 2,819; Netherlands 1,851.
Peat and briquets thousand tons	22	24	Netherlands 11; Poland 6; U.S.S.R. 4.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	816,567	717,801	Gabon 6,713; Syria 6,615; Tunisia 4,837; Angola 2,058; Norway 994.
Refinery products:			
Gasoline, motor spirit do	28,466	23,800	France 3,621; Italy 3,613; Spain 842.
Kerosine, white spirit do	9,951	10,695	Netherlands 7,598.
Distillate fuel oil do	169,887	140,912	United Kingdom 5,409; Romania 4,976; Belgium-Luxembourg 4,663; Spain 4,469.
Residual fuel oil do	33,520	26,507	France 4,356; Belgium-Luxembourg 1,965; Venezuela 1,066.
Lubricants do	1,576	1,463	Netherlands 294; United Kingdom 252; Netherlands Antilles 238; United States 217.
Other:			
Mineral jelly and wax do	1,104	1,346	Netherlands 260; France 118.
Unspecified do	52,402	56,721	U.S.S.R. 3,479; France 2,926; Saudi Arabia 2,758; Belgium-Luxembourg 1,729.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons	617	784	Netherlands 342; United Kingdom 108; Belgium-Luxembourg 87; France 81.

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—In 1975 the Federal Republic of Germany's nine reduction plants had a total capacity of about 755,000 tons per year.[3] The country's leading primary aluminum producer was the Vereinigte Aluminium Werke AG (VAW), which accounted for almost half of the total; five other producers accounted for the remainder.

There were a number of industry developments in the aluminum industry during the year. Kaiser Aluminium and Chemical Corp. acquired the remaining 50% interest in the prefabricating facilities of KAPAL. Hamburger Aluminium Werke sold its Hamburg reduction plant on a 22½-year installment plan to a group consisting of Reynolds Aluminium Deutschland, Vereinigte Aluminium Werke, and Vereinigte Metallwerke Ranshofen-Berndorf AG.

The Leichtmetall GmbH announced its intention to sell its 50% interest in its Essen reduction plant. Finally, Gebrüder Giulini GmbH declared its intention to seek partners to operate its 143,000-ton-per-year Ludwigshafen reduction plant on the Rhine River.

Reduced domestic and foreign demand resulted in a poor year for the aluminum industry by 1974 standards. Although production of primary aluminum was affected

[3] U.S. Embassy Düsseldorf, Federal Republic of Germany. State Department Airgram A-34, Mar. 19, 1976, p. 4.

only slightly, with plants running under nine-tenths of capacity, semifabricated and secondary producers suffered major declines. At $0.45 the 1975 selling price of West German aluminum was only 7% higher than in 1969.[4]

Iron and Steel.[5]—In 1975 the Federal Republic of Germany remained Europe's largest and the world's fourth largest steel producer, although the country's steel industry was hard hit by world recession. Increased production costs and tumbling selling prices resulted in sizable steel mill operation losses. Average utilization rates of plants were an estimated 64% in 1975. Of the country's raw steel output, basic oxygen plants accounted for about 69%; open-hearth plants, 17%; electric furnaces, 13%; and Bessemer plants, 1%.

The steel industry was comprised mainly of 13 integrated and 4 semiintegrated steel companies, 6 ministeel works, 24 specialty product makers, 9 tube and pipe manufacturers, and 15 various firms including rerollers and strip coaters. In 1975 the average number of persons employed in the iron and steel industry was approximately 486,000, including about 311,000 in the iron and steel works. Furthermore, the iron ore mines employed 2,550 persons.

In 1975 the Federal Republic of Germany was heavily dependent on iron ore supplies imported from Brazil, Australia, Sweden, Libya, and 19 other countries. Dwindling domestic production supplied less than one-tenth of requirements.

Industry developments in 1975 included the consolidation of the leading position of the ATH, the western world's sixth largest steel group, with the acquisition of Rheinstahl AG, Essen. Rheinstahl Hüttenwerke was renamed Thyssen Heinrichshütte and operates as one of the three integrated steel companies within the Thyssen group, the others being ATH itself and Thyssen Niederrhein AG. Following the Rheinstahl purchase, ATH took the opportunity to realize an important merger in the special steel sector, bringing together two of Germany's three largest producers in the field—its own subsidiary, Deutsche Edelstahlwerke (DEW), and Rheinstahl's Edelstahlwerke Witten. The new grouping is known as Thyssen Edelstahlwerke AG.

The Neunkirchen Eisenwerke AG and Otto Wolff AG, Köln, agreed to place the steelmaking interests of both companies under joint management.

The Common Market Commission authorized Friedrich Krupp Hüttenwerke AG, the steelmaking subsidiary of Fried. Krupp GmbH, to acquire 96% control of the Stahlwerke Südwestfalen AG, a specialty steel producer. In 1975, Südwestfalen's main shareholders were Hoesch Werke AG, another steelmaker; Allianz Versicherungs AG; and the Agricola Verwaltungs AG, a banking concern.

In another decision, the Common Market Commission ruled that a proposal to set up a subsidiary by Korf–Stahl AG of Baden-Baden and a French firm, Sacilor Acieries et Laminoirs de Lorraine S.A., did not violate EEC competition rules. The new subsidiary, Acieries et Laminoirs du Rhin S.A. of Ottmarsheim, south of Heilbronn, was to have an annual capacity of 450,000 tons of wire rods.

In 1975, ATH commissioned two new 100,000-ton-per-year continuous slab casting plants, one at its Beeckerwerth works and the other at Ruhrort, both near Duisburg. Furthermore, Fried. Krupp Hüttenwerke commissioned two 300-ton oxygen converters at its Rheinhausen steelworks.

Peine-Salzgitter AG (PS) ordered a 1.8-million-ton-per-year pig iron blast furnace from Demag AG. The furnace was to be commissioned in 1977 at PS's steelworks at Salzgitter, south of Braunschweig. Fried. Krupp Hüttenwerke also ordered a similar 1.8-million-ton-per-year blast furnace.

Stahl and Walzwerk Lübeck, a newly formed company, placed orders for a ministeel plant to be located at Travemünde on the Baltic. The plant will comprise initially a 70-ton electric arc furnace and a six-strand continuous casting machine for making billets.

In November 1975, ATH closed down one of its last open-hearth melting furnaces, at Ruhrort near Duisburg. This completed the conversion of the plant to the Linz-Donawitz (LD) steelmaking process. Previously, the Stahlwerke Röchling-Burbach GmbH had closed down its last basic bessemer steelmaking plant at Burbach near Saarbrücken, when commissioning a second 100-ton LD converter. In addition, the Eisenwerk Annahütte Alfred Zeller, the Bavarian semiintegrated steel company, terminated operations at its works at Hammerau, Oberbayern.

[4] Page 5 of work cited in footnote 3.
[5] U.S. Embassy, Düsseldorf, Federal Republic of Germany. State Department Airgram A-87. June 11, 1976, p. 6.

After exhaustion of ore reserves in the St. Anna pit, Eisenwerk Gesellschaft Maximilianhütte brought into production the 180,000-ton-per-year Eichelberg mine west of Nürnberg in northern Bavaria.

Lead and Zinc.—In 1975, a major event of the Federal Republic of Germany's lead and zinc industry was the closing of the Ramsbeck mine in Sauerland, North Rhine, Westphalia. Exploration work at the Ramsbeck mine continued, aimed at finding workable ore deposits believed to exist there.

In 1975, lead and zinc ore production decreased slightly. Smelter production of lead metal had to be cut by about one-fifth and that of zinc by one-fourth compared with 1974 production because of lesser consumer demand.

Three companies—Preussag Aktiengesellschaft Metall, Sachtleben Bergbau GmbH, and AG Des Altenbergs für Bergbau und Zinkhüttenbetrieb—operated the Federal Republic of Germany's four lead and zinc mines and beneficiation plants: Blei-Zinkerz-Bergwerk Lüderich near Cologne; Metallerz-, Schwefelkies und Schwerschpatbergwerk Meggen near Lennestadt; Erzbergwerk Rammelsberg near Goslar, Harz; and Erzbergwerk Grund in the same area. Some copper concentrate was also produced from the ores. About two-thirds of the lead ores and about one-half of the zinc ores used for metal production were imported in 1976.[6]

NONMETALS

Cement.—In 1975, production of cement decreased further under the influence of the low level of activity in the building industry. As utilization of plant and equipment was only about 60%, any investments made were restricted to the most essential replacements and economy measures.[7] At yearend 1975, 61 companies operated 86 cement plants in the country.

Fertilizer Materials.—In 1975, the Federal Republic of Germany remained one of West Europe's major potash producers and exporters, although there were some cutbacks in potash production due to lesser demand.

Kali and Salz AG, a subsidiary of Badische Anilin und Soda Fabrik AG, was the country's major potash producer. The company controlled eight mines, five of which were in the Hannover area. Production capacity of the Sigmundshall potash mine near Kassel was enlarged by 200,000 tons per year. The company's largest mine was the over-6-million-ton-per-year Wintershall mine.

Kali Chemie AG, a subsidiary of Solway & Co., S.A. of Belgium, operated only the Friedrichshall mine near Hannover after June when its Ronnenberg mine at Ronnenberg had to be abandoned after water flooding. The disaster destroyed a capacity of 800,000 tons of potash salt per year.

In 1975 nitrogen production was decreased to cope with slack demand both at home and abroad. The Federal Republic of Germany's nitrogen industry was controlled by six companies with a total installed anhydrous ammonia capacity of 2.95 million tons in 1975. A large portion of the industry was concentrated in the hands of three major chemical concerns, Badische Anilin und Soda Fabrik AG (BASF), VEBA Chemie AG, and Hoechst AG, these three accounting for two-thirds of the industry's installed nitrogen capacity in 1975. The industry was heavily concentrated in the Ruhr region and depended largely on imported hydrocarbons as a feedstock.[8]

VEBA Chemie AG was granted a license by Fried. Uhde GmbH, Dortmund, to build a 548,000-ton-per-year ammonia plant at Brunsbüttel at the western end of the Kiel Canal.

Sulfur.—Production of recovered sulfur continued to increase and is expected to grow even further as more planned plant capacity comes onstream. Ruhrchemie AG has awarded a contract to Davy Powergas GmbH for the construction of a Claus plant for converting refinery gases to elemental sulfur.

Sulfuric acid production, relying heavily on imported brimstone, decreased due to lessened domestic and foreign demand.

MINERAL FUELS

Bituminous coal, lignite, and to a lesser extent natural gas, crude oil, and hydroelectric power were the main primary energy sources produced in the Federal Republic of Germany in 1975. They supplied somewhat less than half of the country's energy requirements. The re-

[6] Fachvereinigung Metallerzbergbau E.V., (Düsseldorf). Annual Report and Statistics. 1975. P. 3.
[7] Polysius AG, (Neubeckum). Annual Report 1975. P. 9
[8] Nitrogen. No. 98, November/December 1975, pp. 26–29.

mainder was supplied mainly by imported crude oil, petroleum products, natural gas, bituminous coal, electric power, and enriched uranium fuel. Table 5 shows supply and apparent consumption of energy for 1974 and 1975.

Table 5.—Federal Republic of Germany: Supply and apparent consumption of energy-producing materials for 1974 and 1975

(Million tons of standard coal equivalent) [1]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Fuel-wood and peat	Hydro-electric power	Nuclear power [2]	Other [3]
1974:								
Production [4]	168.2	129.3	8.9	22.5	0.5	5.5	--	1.2
Imports	254.4	9.8	202.3	23.9	--	5.3	4.1	--
Exports	52.5	31.3	17.6	.2	--	3.4	--	--
Apparent consumption	361.1	107.8	193.6	46.5	.5	7.4	4.1	1.2
1975: [p]								
Production [4]	161.0	125.7	8.5	19.6	.5	5.5	--	1.2
Imports	239.0	7.3	189.2	30.5	--	[e] 5.0	7.0	--
Exports	57.6	22.1	31.9	.1	--	[e] 3.5	--	--
Apparent consumption	342.4	110.9	165.8	50.0	.5	7.0	7.0	1.2

[e] Estimate. [p] Preliminary.
[1] 1 ton of standard coal equivalent (SCE) =7,000,000 kilocalories.
[2] Produced domestically from imported nuclear fuel.
[3] Includes solid wastes, refuse, waste heat, and steam for generating power.
[4] Includes only primary energy.

Sources: Statistik der Kohlenwirtschaft e.V. (Essen). Zahlen zur Kohlenwirtschaft. V. 105, March 1976, p. 4.
Statistisches Bundesamt, (Wiesbaden). Industrie und Handwerk. Reihe 2, Produktionsindices, Index der Arbeitsproduktivität, Produktion Ausgewählter Industrieller Erzeugnisse. December 1975 and February 1976, pp. 12–27.
Industrie und Handwerk. Reihe 2, Specialhandel Nach Waren und Länder. December and year 1975, p. 129.
Bundesamt für Gewerblichte Wirtschaft. Mineralölstatistik der Bundesrepublik Deutschland, 1975. Mar. 12, 1976.

Coal.—In 1975, the Federal Republic of Germany was one of Europe's major coal producers with about one-fifth of the continent's total. In addition, the Federal Republic of Germany was a net coal exporter. Domestic coal supplied almost one-third of the country's energy requirements. Import quotas and subsidized coal prices helped to support production of bituminous coal. However, production declined, while lignite production decreased for the first time since 1971.

In 1975, there were 46 coal mines, 25 coking plants, 6 briqueting plants, and 31 coal-fired powerplants in the Federal Republic of Germany's bituminous coal industry.[9] The industry was controlled by 15 companies, including 11 in the Ruhr, 2 in the Aachen area, and 1 each in Saarland and Lower Saxony. The industry's largest industrial group was the Ruhrkohle AG (RAG), controlling more than three-quarters of the Federal Republic of Germany's bituminous coal production and 6 out of 11 of the Ruhr's companies.[10] At yearend 1975, employment in the country's bituminous coal industry was about 206,000 persons.

The Federal Republic of Germany's lignite industry was controlled essentially by four large companies, located one each in the Rhineland, Lower Saxony, Hesse, and Bavaria. The largest among them was the Rheinische Braunkohlenwerke AG in the Rhineland, accounting for more than 76% of the country's lignite production. Employment in the lignite industry at yearend totaled about 20,000 persons.

Industry Developments.—The Federal Republic of Germany continued to uphold the concept last set forth in 1972 in the Third Electrification Law, requiring industry to buy 30 million to 33 million tons of bituminous coal per year through 1980. Actually, industry is expected to take only 28 million tons in 1976, of which 2 million are for stocks. The German consumer carries the cost of the subsidy for inducing the power industry to use more domestic coal in the form of a tax of 3.5% levied on power sales, to be raised temporarily

[9] Coal Statistics, Inc. (Statistik der Kohlenwirtschaft e. V.) (Essen). Zahlen zur Kohlenwirtschaft. V. 105, March 1976, p. 17.
[10] Verlag Glückauf GmbH. Yearbook of Mining 1976 (Jahrbuch für Bergbau, Energie, Mineralöl und Chemie, 1976). Essen, 1976, p. 942.

to 4.5% in 1976 and 1977. The bill also increases incentives to encourage industry to build 6,000 megawatts of new coal-fired generating capacity. The bill provides for investment grants of $61 to $73 per kilowatt-hour of new installed capacity.

Rapidly growing pithead stocks reached about 15 million tons by yearend, causing serious financial problems to the Federal Republic of Germany's coal industry. The industry was expecting to receive additional Government aid amounting to about $80 million to carry part of the cost of stockpiling.

Saarbergwerke AG's 1975–79, 5-year investment plan earmarked $163 million for new plant and equipment in the Saar. The main items were $27 million for a new incline and coal storage facilities at the Ensdorf mine in the Saar, $43 million for miscellaneous mechanized mining equipment, $11 million for pollution control at the Fürstenhausen, Saar, coking plant and at three other company powerplants, and $6 million for the company's coal gasification project.

The Rheinische Braunkohlenwerke AG voted to raise its capital from $93 million to $134 million. The company ordered a $40 million, 240,000-cubic-meter-per-day bucket wheel excavator from the Maschinenfabrik-Augsburg-Nürenberg (MAN). Construction continued on a new-type 115,000-ton-per-year lignite coking plant at Brikettfabrik Fortuna Nord, Niederaussem, near Köln. The company continued planning operations of a large open pit mine near Hambach, west of Köln. Overburden was to be dumped into the depleted Frechen and Fortuna-Garsdorf mines. The company's long-range investment plan provided for $4.5 billion over a period of 14 years (1990).

Preussag AG decided to close down the Westfeld mine at the Steinkohlenwerke Ibbenbüren, North Rhine, Westphalia, in 1975. Capacity of the company's larger Ostfeld mine at the same location was to be increased by 1978.

After 2 years of negotiations, the Federal Republic of Germany concluded a treaty with East Germany for exploiting the lignite deposits at the common border area of Helmstedt-Harbke, containing an estimated 15 million tons of recoverable reserves.

Construction of Steag AG's Voerde and Möllen, North Rhine, Westphalia, coal-fired powerplants of 700 megawatts each was temporarily suspended by the Düsseldorf Administrative Court's Third Chamber for environmental reasons.

Nuclear Power.—In 1975 the Federal Republic of Germany was among the world's leading nations in the field of nuclear powerplant technology, research, and development. With the commissioning of the 1,200-megawatt nuclear powerstation, Biblis A, in Biblis in April 1975, the country's nuclear industry had created a standard model suitable for export.

On January 1, 1976, the Federal Republic of Germany had 10 nuclear powerplants with a total capacity of 3,494 megawatts. Furthermore, 12 plants (total capacity, 11,975 megawatts) were under construction, and 14 additional power stations with a total capacity of 17,959 megawatts were in the planning stage. In the following six installations, under construction at yearend, the reactors were scheduled to become critical during 1975:[11]

	Megawatts
Biblis B	1,300
Neckar GKN–1	855
Brunsbüttel KKB	806
Unterweser KKU	1,300
Isar KKI	907
Philipsburg KKP–1	900

Petroleum and Natural Gas.—In 1975, the Federal Republic of Germany remained Western Europe's largest consumer of crude oil and petroleum products, accounting for about one-fifth of the total, although consumption had decreased for the second consecutive year. The Government-controlled firms, VEBA and Gelsenberg, continued to integrate their petroleum operations. VEBA lost money again ($100 million in 1975), but the company hoped to improve its competitive position by investing some $4 billion to $5 billion over the next 5 years in energy-related projects.

In 1975 the most important organizations in the petroleum industry were the Aussenhandelsverband für Mineralöl (AMF), a trade association of petroleum companies active in foreign trade; the Bundesverband Freier Tankstellen und Unabhängiger Mineralölhändler (BFT), the association of independent filling stations and merchants; the Mineralöl Zentral-

[11] Atomwirtschaft, (Atomic, Energy), Düsseldorf). March 1976, as reported in FSD A–135 (Frankfurt), July 1, 1976, p. 19.

verband (MZV), a central association for petroleum firms; UNITI, an association of middle-sized petroleum firms; and the Mineralölwirtschaftsverband, the main official organization of the whole petroleum industry. About 700 firms were members of these organizations, including about 100 that were in some competition with several of the major international companies active in the Federal Republic of Germany. They controlled only about 20% of the petroleum market; therefore, the effect on pricing was small. Only developments in the Government-sponsored oil companies, VEBA and Deminex Deutsche Erdölversorgungsgesellschaft mbH (Deminex), have any chance of affecting overall petroleum industry operations, which are dominated by the major international companies active in the Federal Republic of Germany.

The oilfields of the Federal Republic of Germany require secondary and tertiary exploitation. Recoverable proven and probable crude oil reserves on the Federal Republic of Germany's mainland were estimated at about 70 million tons[12] in 1975. Drilling during the year totaled about 220,000 meters. According to experts, a discovery of major new oilfields on the mainland is not expected. Deutsche Texaco AG led a consortium of seven companies for performing a deep exploration program. This program was started with three wells, the Miesbach 1, Bavaria, and the Vepke-Asse, and Devon 1 wells south of Wolfsburg. The Mölln Tief 1 was to be started in 1976 for surveying Schleswig-Holstein's pre-Permian subsoil to a depth of 7,000 meters.

There were plans to step up exploration in the West German sector of the North Sea. Drilling continued at the A–6–2 well and another was planned 125 kilometers northwest of the island of Borkum in the Newcomer Block H–4.

State-controlled Deminex was active in petroleum exploration and development abroad. In 1975 the company was involved in 22 exploration projects in 14 countries, covering concessions of almost 220,000 square kilometers, one-half of it offshore.

Refineries in the Federal Republic of Germany utilized only about 62.2% of capacity. This was due to lesser demand and also imports of light petroleum products. In 1975, 22 companies controlled 33 refineries with a total capacity of about 153.9 million tons per year. The 8-million-ton (throughput) Wilhelmshafen refinery of Mobil Oil AG started operations during 1975. Erdölraffinerie, Ingolstadt, reported a 1-million-ton capacity increase of its refinery, while Esso AG, Karlsruhe, reported a capacity of 1 million tons less than previously. Closing of Mobil Oil's Bremen refinery and Elf Bitumenwerke GmbH's crude oil distillation plant was also reported. There were plans to close down one of VEBA Chemie's older plants near Gelsenkirchen.[13]

Most of the Federal Republic of Germany's crude oil imports were transported from the major pipeline terminals in the Mediterranean and the North Sea directly to inland processing plants. The terminals were those of Wilhelmshafen, Trieste, Genoa, Marseilles, and Rotterdam.

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[12] London Mining Journal. Mining Annual Review 1976. P. 529.

[13] Erdöl Informationsdienst, as reported in FSD A–13 (Hamburg), July 1, 1976.

The Mineral Industry of Ghana

By Janice L. W. Jolly [1]

The 1975 mineral industry of Ghana consisted of bauxite, diamond, gold, and manganese mining; salt and cement production; and refinery production of aluminum and of petroleum products from imported raw materials. Production increased compared with that of 1974 for manganese (48%) and petroleum refinery products (7.3%), but decreased for bauxite (21.4%), aluminum (8.9%), diamond (9.5%), and gold (7.6%).

Guidelines for the Government's new 5-year development plan (1975–1980) were announced early in 1975, although the plan itself was not expected to be implemented until 1976. The plan aimed at building an independent economy structured on resource potential. The development of the industrial sector was to involve rehabilitation of existing industries as well as establishment of new ones. The Kpong dam and hydroelectric scheme was to be a major project in the plan. Ghana will require this new source of power by 1981 when existing sources are expected to become fully utilized. Costs were now estimated at about $250 million,[2] of which 80% would be foreign exchange costs. In the mining sector, the plan was geared toward solving problems relating to marketing arrangements and shortages of equipment. Intensification of prospecting for new deposits, modernization of present exploitations, and reactivation of abandoned mines were all being considered. Exploitation of the Kibi bauxite deposit and creation of an aluminum industry complex were cited as major development interests. The main problems set forth in the guidelines were high urban unemployment, shortages of skilled labor, inadequate training facilities, and low labor-absorptive capacity in the modern sector of the economy. Domestic inflation persisted at about 25% annually, reflective of external influences such as costs for imported oil and food. Import problems continued into 1975 as a result of rising imported oil prices and the resulting cutback in import licenses initiated in 1974. A decline in per capita gross domestic product (GDP) was expected to continue from 1975 through 1976 as resources available to finance imports were only sufficient to support a 2% GDP growth while the population was increasing 2.9%.

The Government published a new Investment Policy Decree on April 24, 1975, establishing a policy of majority participation and Ghanaianization in much of the mining industry. According to the decree, the mineral-extraction industries (except oil and bauxite) should be 40% Ghanaian if valued below $435,000; if valued above this level, at least 55% should be owned by the Ghanaian State. All foreign enterprises were expected to set up training to allow Ghanaians to take over from expatriates. Firms extracting or processing bauxite and alumina must give the Ghanaian State a share not exceeding 30%, and must allow a share not exceeding 20% in petroleum production. The share in each case was to be determined by the National Redemption Council (NRC). An Investment Policy Implementation Committee (IPIC) was to be appointed by NRC to implement the decree and share responsibility for finance. Where the decree requires sale of part or full ownership to Ghanaians, that part of the capital shall be vested in IPIC, which shall determine

[1] Physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from the Ghana new cedi (N¢) to U.S. dollars at the rate of 1N¢ = US$0.8696.

the maximum price and act as intermediary. All businesses affected by the decree were asked to provide the IPIC with details of their operations not later than August 31. The final date for implementation of the Investment Policy Decree was first set at December 31, 1975, but later changed to June 30, 1976.

Ghana established a joint agency with Togo and Dahomey to supply electrical power from Akosombo. Ghana agreed to make available 50 megawatts of electricity for a continuous period of 115 years. In line with the policy of economic cooperation in the West African subregion, the Volta River Authority (VRA) was considering interconnection of the hydroelectric power systems of Ghana and Ivory Coast. At yearend 1975, VRA was inviting tenders for civil engineering works at the proposed Kpong damsite on the Volta River, which would include a 75,000-cubic-meter concrete spillway to accommodate 15 radial gates, earth-fill abutment dams of 1,300,000 cubic meters, and a conventional power station to accommodate four 40-megawatt generating units.

A fact-finding European Communities (EC) delegation visited Ghana to discuss EC's technical and financial cooperation for 1976–80 under the Lome Convention. At the end of the visit, it was announced that the European Investment Bank (EIB) would assist the cooperative cement project of Ghana, Togo, and the Ivory Coast to be located in Togo. EIB was to loan $7 million to help finance construction of a clinker-production plant and installations at the Tabligo, Togo, limestone quarry. The World Bank also agreed to grant a $49.5 million loan to the West African Cement Co. for construction of its plant at Tabligo. In addition, the World Bank was to grant each participating country $3.5 million to acquire equity shares in the venture. Construction was to begin in January 1976, and the plant would be commissioned in 1979.

PRODUCTION AND TRADE

Mineral commodity production, excluding petroleum refinery production, was valued at $241 million in 1975 compared with an estimated $255 million for 1974. The value of aluminum refinery production was estimated at $126 million, bauxite at $3.7 million, diamond at $12 million, gold at $83 million, manganese ore at $14.7 million, cement at $450,000, and salt at about $7,000 for 1975.

Ghana Supply Commission, the sole importer of crude oil and chief exporter of petroleum products, imported 8.6 million barrels of crude petroleum for use in the Tema refinery in 1975. Crude petroleum was imported from the U.S.S.R., Nigeria, and Libya. Petroleum products (liquefied petroleum gas and fuel oil) were exported to Nigeria and the United States.

Imports increased from $460 million in 1973 to $822 million in 1974. There was a slight improvement from the 1974 situation as imports declined to $805 million in 1975. By mid-1975, import licenses for 1976 were being issued in advance to help alleviate supply problems. Allocations were being made insofar as the balance of payments permitted and were sufficient to keep factories running. The Bank of Ghana and the Ghana Manufacturers' Association were also supporting an export drive, and a research and technical services unit was set up to explore domestic and particularly foreign markets for locally produced goods. Exports in 1975 were valued at $820.5 million compared with $754.8 million in 1974, producing a badly needed trade surplus.

The export levy on gold of $2.18 per each troy ounce over 100,000, which was instituted in 1973, was raised to $2.61 in the budget proposal for fiscal year 1974–75. The levy was raised to obtain additional revenue for development programs and because the price of gold continued at a high level. An export permit is required for most items leaving Ghana. Export-control measures were adopted to encourage and protect industrial processing firms such as those utilizing the limited local supply of ferrous scrap. The majority of ferrous scrap was used by the Government-owned Tema Steelworks, which produced steel bars.

Ghana was to provide storage facilities for Nigerian goods that could not be located at Lagos because of port congestion in 1975. Building materials and cement were to be diverted to Ghana for transport by road to Nigeria. The agreement was a starter for the treaty signed by the Economic Community of West African States (ECOWAS) in Lagos on May 28.

Ghana also became a designated beneficiary under the U.S. Generalized System of Preferences (GSP) of the Trade Act of 1974; the new status is to be implemented on January 1, 1976. Based on 1974 Ghanaian exports to the United States, 25 important Ghanaian products valued at $2.1 million would enter the United States duty free under GSP, bringing to 59% the total duty free U.S. imports from Ghana.[3] In recent years, the United States has been in second or third place among Ghana's suppliers. In the first half of 1975, the United States moved into first place, accounting for 15% of Ghana's imports.

[3] U.S. Embassy, Accra, Ghana. State Department Airgram A-4, Jan. 20, 1976, 7 pp.

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

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum:			
Bauxite, gross weight	309,908	363,129	285,291
Metal, smelter production, primary	150,707	157,198	143,220
Gold thousand troy ounces	723	567	524
Manganese ore and concentrate, gross weight	318,211	250,253	370,805
NONMETALS			
Cement thousand tons	436	[e] 450	[e] 500
Diamond:			
Gem thousand carats	232	257	233
Industrial do	2,085	2,316	2,095
Total do	2,317	2,573	2,328
Salt	43,690	52,000	[e] 60,000
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	1,726	1,967	2,154
Jet fuel do	199	318	364
Kerosine do	735	743	795
Distillate fuel oil do	1,956	2,382	2,549
Residual fuel oil do	2,309	2,606	2,811
Other do	60	62	--
Refinery fuel and losses do	351	418	445
Total do	7,336	8,496	9,118

[e] Estimate. [p] Preliminary.
[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 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	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite and concentrate	312,229	392,026	United Kingdom 236,245; Netherlands 126,860.
Metal including alloys, unwrought and semimanufactures	r 126,192	84,151	United Kingdom 38,025.
Gold bullion -- thousand troy ounces	722	696	Switzerland 687.
Iron and steel metal including alloys, all forms	r 4,224	4,085	West Germany 2,873; Poland 914.
Manganese ore and concentrate	290,131	276,071	Norway 64,830; Japan 54,091; United Kingdom 40,957.
Other nonferrous metal, scrap, n.e.s	1,797	1,259	Belgium-Luxembourg 554; Netherlands 435; West Germany 163.
NONMETALS			
Cement	--	10,078	Egypt 5,098; Ireland 2,917; Denmark 1,080.
Diamond, all grades - thousand carats	2,267	2,556	United Kingdom 1,721; Netherlands 410; Belgium-Luxembourg 310.
Salt	12	1,474	Upper Volta 988; Mali 463.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	2	--	
Refinery products:			
Gasoline do	2	(1)	All to Togo.
Kerosine and jet fuel do	6	1	All to Dahomey.
Distillate fuel oil do	(1)	287	United States 286.
Residual fuel oil do	1,464	1,686	United States 1,519; West Germany 129.
Lubricants do	(1)	(1)	Mainly to United States.
Total do	1,472	1,974	

r Revised.
[1] Less than ½ unit.

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

Commodity	1973	1974
METALS		
Aluminum:		
Oxide and hydroxide	220,494	327,136
Metal, unwrought and semimanufactures	r 3,363	4,630
Copper metal including alloys, all forms	752	1,405
Iron and steel metal including alloys, all forms	153,186	138,162
Lead metal including alloys, all forms	304	683
Platinum-group metals, including silver troy ounces	17,393	102,408
Tin metal including alloys, all forms	75	182
Zinc metal including alloys, all forms	870	550
Other, n.e.s.:		
Ore and concentrate	150	89
Scrap	235	(1)
Metal including alloys	r 701	2,297
Oxides, hydroxides and peroxides of metals, n.e.s	r 1,763	2,796
NONMETALS		
Abrasives, natural	745	1,478
Asbestos	4,008	21,613
Cement:		
Clinker	447,770	500,107
Portland	10,078	16,676
Clays and clay products (including refractory brick):		
Clays, n.e.s	338	552
Products	7,119	3,982
Fertilizer materials, all types	r 15,591	4,925
Gypsum and plasters	10,108	17,499
Lime	5,673	4,138
Salt and brines	384	590
Sodium and potassium compounds, caustic soda	8,707	9,529
Stone, sand and gravel	988	1,122
Sulfur, sulfuric acid	1,293	894
Talc	737	1,389
Other, crude [2]	r 540	1,189
MINERAL FUELS AND RELATED MATERIALS		
Asphalt, natural	67	39
Coal and coke including briquets	18,248	6,203
Hydrogen, helium and rare gases	75	155
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	6,434	8,246
Refinery products [3] do	r 1,079	549
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 147	128

r Revised.
[1] Less than ½ unit.
[2] Includes mica, amber, meerschaum, jet, chalk, and other unspecified nonmetals.
[3] Total excludes materials valued at U.S. $5,616 in 1973 and U.S. $5,184 in 1974.

COMMODITY REVIEW

METALS

Aluminum.—Plans were finalized for expansion of the Volta Aluminium Co. Ltd. (VALCO) by Kaiser Aluminum & Chemical Corp. of the United States. The plant is now estimated to cost $65 million and be completed by late 1976. The new and 5th pot line was to increase capacity by 50,000 tons for an annual total of 198,000 tons. Kaiser Aluminum and Reynolds Metals Co. were to provide $16 million of the total expansion cost and the rest ($49 million) was to come from five other private U.S. and Ghanaian sources. Additional electrical power needed has been arranged for with VRA. VALCO imported its alumina from the United States, Jamaica, and Australia.

Bauxite and Alumina Study Co., Ltd. (BASCOL), the Ghanaian Government, and Kaiser Aluminum were proceeding with feasibility studies concerning development of the Kibi bauxite deposits and accompanying alumina plant. The Japanese company Aluminium Resources Development Co. (ARDECO) spent 1975 negotiating on the project, but at yearend was expected to withdraw. Aluminum demand declined 30% in 1975. At yearend, aluminum producers were hoping that the worst of the slump was over, and a modest improvement in shipping volume was beginning.

Ghana Bauxite Co. Ltd. (GBC) operated Ghana's only bauxite mine near Awaso. Bauxite from this mine was shipped to the United Kingdom, the United States, and Canada for processing.

Gold.—The State Gold Mining Corp. (GMC) was engaged in a development and exploration program that was expected to cost $173 million for its mines at Tarkwa, Prestea, Konongo, and Dunkwa. Prospecting was started at Busenchem near Prestea and Pepe near Tarkwa. Restoration of the Obenemase mine in the Ashanti Region was also forecast. The gold mines of Nangodi, closed since 1941, may also be reopened. Gold deposits of interest were also discovered near the small village of Same, where a mine had existed but was abandoned in 1972.

Ghana and the United Nations Development Program (UNDP) signed the first four agreements under which UNDP will assist GMC in exploring for new gold deposits. Investment in this program amounted to $3.9 million.

Prospecting was also being carried out in the Central Region near Twifu-Hemang for gold, diamond, and other minerals. A contract was awarded to Parolle Ltd., of the Reyrolle Parsons Group, Newcastle upon Tyne, United Kingdom, for supply of electrical plant items for a substantial extension to the power-distribution system at Prestea mine. The extension was scheduled for completion in 1977. A new 55-kilovolt substation and extensions to the two existing 55-kilovolt installations will be provided.

The Commissioner for Lands and Mineral Resources commissioned a new shaft for the Obuasi mine of the Ashanti Goldfields Corp. (AGC) Ghana Ltd., on July 26. The shaft, which will cost $3.2 million to construct, is expected to provide a hoisting capacity for up to 50,000 tons of rock per month. The shaft depth will be 7,000 feet. The installation will require a surface refrigeration plant with a cooling capacity of 4,000 ice tons. The life expectancy of the mine was placed at a minimum of 15 years. Gold reserves at AGC were estimated to be 3.8 million tons. The corporation was processing 45 bars per month of refined gold, which was expected to increase as AGC's 9,000 employees geared up to work weekends to raise output. The Government was encouraging the increase in gold output to take advantage of the relatively high world price for gold.

Iron.—Interest continued in the investigations of the iron deposits at Shieni and Opon Manso and their potential. The Government was studying the possibility of an iron-steel complex at Opon Manso. Construction of a $2.6 million steel plant was in progress at Takoradi as an investment by the Ghana National Investment Bank and a West German firm. The plant will function in part from local iron scrap and was forecast to have a production of 30,000 tons per year. Ghana's steel plant at Tema experienced a strike lasting several weeks, but by yearend employees were back at work. Th first phase of automatization of the plant was complete, and the extension work in progress was to permit doubling production to about 30,000 tons per year. Approximately $4.3 million was now estimated as necessary for complete rehabilitation of the Tema Steelworks. Up to $1.3 million had already been invested to recondition the wire mill and foundry.

NONMETALS

Diamond.—Ghana's diamond output continued to come mainly from the concession of Ghana Consolidated Diamonds Ltd. (GCDL). The other two firms, Cayco (Ghana) Ltd. and Dunkwa Goldfields, were small diamond producers and are no longer active. Around 90% of Ghana's diamond production is of industrial quality. GCDL is owned 55% by the Government and 45% by the British firm, Consolidated African Selection Trust (CAST), and operates mines in the Eastern Region, about 65 miles from Accra. The company was to acquire an additional concession adjacent to the present area, but mining in the new area will not be started until the present operations are no longer profitable. There are many small private diamond diggers licensed by the Ministry of Lands and Mineral Resources. Their annual production is about 150,000 carats. Diamond Marketing Corp. (DMC), a government company that markets all diamond production, handles sales of GCDL and purchases the output of private diggers. Sales, held three times a year, are made by tender to buyers registered with the DMC. No plans are being made to increase output in 1976; production is expected to remain at its present level.

Limestone and Cement.—Limestone deposits, with reserves estimated at 3.5 million tons at Aseswa in the Eastern Region, are to be entrusted for exploitation to the Development Corporation of that region. Available recognized resources of limestone, including Nauli, Bonga Da, Buipe, and Aseswa, exceed 600 million tons, and prompted the Ghanaian Government to propose participation by Norwegian investors in their development. Meanwhile, Ghana Cement Works signed a 3-year contract with Norwegian and Swedish companies for providing clinker, which is needed for its crushing plant at Tema.

Quarry Stone.—Two large stone quarries were opened in Ghana at Akaklu (district of Ho) and Alavanyo (district of Kpandu).[4]

MINERAL FUELS

Petroleum.—On January 10, Shell International Petroleum Co., Ltd. signed an oil-prospecting agreement for the Voltaian Basin near Attebubu in the Brong-Ahafo Region. The company was incorporated in Ghana and was called Shell Exploration and Production Co. The area prospected will cover 11,000 square miles in 10 selected inland areas. Preliminary seismic studies were to be carried out. The Commissioner for Lands and Mineral Resources announced that the terms of the existing oil-exploration agreement drawn up in 1968 with various exploration companies should be liberalized to attract more prospectors in view of the heavy expenditures involved in oil exploration. Among the new terms being introduced are the duty-free importation of oil-exploration equipment and a guarantee for the repatriation of profits. Should government participation in an oil company be necessary, participation would be up to 20%.

In 1975, there were 10 exploration companies searching for gas and oil in Ghana. Amoco Ghana Exploration Co. (Amoco) signed an option to acquire a 50% interest from Oceanic in an offshore block and had started drilling in the Tano Basin, 18 miles offshore in 200 feet of water with the jack-up rig "Mercury." Phillips Petroleum Co. acquired a full interest in an oil-prospecting license covering several offshore blocks, and also became operator for the Mobil group after completion of the Cape Three Points 1 well by Zapata. Volta Petroleum Co., Ltd., relinquished its permit in the Keta Basin adjacent to the Togo border. Zapata was granted an exploration license for offshore blocks 18, 19, and 20. Amoco, as operator for itself and Burmah Oil Company, Ltd. spudded Burmah 10-4 in the vicinity of the 10-1 Signal Exploration and Development Co. discovery. Amoco conducted a month of marine seismic work. Phillips shot 1,899 line miles of marine reflection surveys in their recently acquired permit, and 284 line miles on the Cape Three Points acreage.[5] Exxon Corp. discovered petroleum just north of Ghana in an Ivory Coast Field where none had previously been found.

Mobil Oil Ghana Ltd. was to join the Government in a $2 million venture to establish two ports on Volta Lake for speeding oil supplies to the area. The Government of Ghana authorized the Ghana Supply Commission to construct an asphalt plant, costing $8.7 million, near the petroleum refinery at Tema. The construction was to take place at the beginning of 1977. EC loaned Ghana $2 million for problems generated by the rise in petroleum prices. By yearend, the Government had taken full control of the country's only refinery, run by Ghanaian Italian Petroleum Co., Ltd. (GHAIP) at Tema.

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[4] Industries et Travaux D'Outre-mer (Paris). Afrique de L'Ouest (West Africa). V. 23, No. 255, February 1975, p. 143.

[5] Biro, P. Petroleum Developments in Central and Southern Africa. Am. Assoc. of Petroleum Geol. Bull., v. 59, No. 10, 1975, pp. 1906–1907.

The Mineral Industry of Greece

By Roman V. Sondermayer[1]

During 1975 Greece remained one of the principal producers of bauxite and nonmetals in Europe and continued to develop its mineral industry. The more important minerals produced domestically, with production expressed in approximate percentages of the world output, were as follows: Magnesite, 12%; pumice, and bauxite, 4% each; alumina, barite, lignite, and nickel, 2% each; aluminum, 1%; and pyrite, 0.49%. Output of other mineral commodities was of only domestic significance.

Performance of the Greek mineral industry in 1975 was mixed and reflected the recession in major industrialized countries, Greece's uneven economic performance, and price fluctuations on international commodities markets. Unemployment in Greece was about 7% and the inflation rate was 14% in 1975.

The mineral industry, including mining, quarrying, smelting, and refining, accounted for about 7% of the gross national product (GNP) of $19,220 million[2] in 1975. The mining and quarrying sector alone accounted for about 1.3% of the GNP.

There were a number of significant developments during 1975. Planning was underway for construction of a 600,000-ton-per-year alumina plant near Itea on the Corinthian Gulf; mine production of gold started near Servia, Kozani; doubling of nickel output at Larymna was announced; a 1-million-ton-per-year cement plant went onstream at Kamari, Boeotia; and offshore drilling continued near the island of Thassos.

During 1975 Government spokesmen emphasized the significance of the mineral industry for the economic development of the country, and Government measures were aimed at stimulating activities in the mineral industry, at the same time bringing the industry under closer supervision. During 1975 three bills to revise the mining code and improve public and private research were discussed in the Parliament. The objectives of the new legislation were to increase Government control over the mining sector; establish governmental supervision of development efforts, exploration, and research programs in the mineral sector; create an Institute of Geological and Mineral Research as the principal public research and supervisory agency in mining; empower the State to oblige mine operators to supply ore to local metallurgical installations; establish a time limit of 50 years on concessions, rights, and leases of state mines with allowance for another 25 years, and in exceptional cases, a second 25 years; exclude foreign individuals or companies from acquiring mining exploration permits; require the approval of the Council of Ministers on foreign applications for mining concessions; regulate reserves or idle mines to prevent hoarding and promote maximum production; and introduce environmental protection and pollution control requirements.

To spur investments, the Hellenic Industrial and Mining Investment Co. (HIMIC) was formed. Capitalization of $85 million was provided by the National Bank of Greece and the Hellenic Industrial Development Bank (ETVA) (37.5% each), the National Mortgage Bank (20%), and the National Investment Bank for Industrial Development (5%). The

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[2] Where necessary, values of Greece's drachma (Dr) were converted to U.S. dollars at the rate of Dr32=US$1.00.

primary objective of HIMIC was to identify and execute projects that are beyond the capability of private enterprise. The Government also established the National Energy Board (NEB) to coordinate the overall energy policy of Greece.

PRODUCTION

Large, recently developed deposits, metallurgical installations, and petroleum refineries in Greece had modern production equipment. However, most of the smaller mining operations were not mechanized and productivity was low. Table 1 shows the mineral production of Greece.

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

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum:			
Bauxite, gross weight ---- thousand tons --	2,748	2,783	3,244
Alumina, gross weight ---- do ----	470	498	459
Metal, primary ----	143,269	148,000	135,600
Antimony, mine output, metal content ----	[r] 120	501	426
Chromium, chromite:			
Crude ore, gross weight ----	43,394	12,813	73,823
Concentrates, gross weight ----	18,462	9,590	22,945
Copper, mine output, metal content ----	[r] 1,038	883	1,076
Iron and steel:			
Iron ore and concentrate, gross weight ----			
Nickeliferous [2] ---- thousand tons --	1,849	2,013	1,974
Other ----	1,580	--	NA
Pig iron and ferroalloys ----	[r] 511,739	500,000	540,000
Crude steel ----	753,323	612,320	1,000,000
Steel semimanufactures [3] ---- thousand tons --	1,080	NA	NA
Lead:			
Mine output, metal content ----	17,777	22,010	12,884
Metal refined: [4]			
Primary ----	[r] 24,000	14,600	12,800
Secondary ----	17,857	11,675	14,833
Manganese:			
Ore, crude, gross weight ----	42,433	52,091	45,248
Concentrate, gross weight [5] ----	6,222	9,072	11,318
Nickel:			
Mine output, nickeliferous iron ore, metal content [6] ----	[r] 26,347	28,692	28,136
Metal, content in alloys ----	13,946	14,761	14,826
Silver, smelter or refinery production thousand troy ounces --	588	575	480
Zinc, mine output, metal content ----	[r] 19,463	24,989	14,707
NONMETALS			
Abrasives, natural, emery ----	7,000	6,775	7,000
Asbestos ----	30	1,820	NA
Barite:			
Crude ore ----	124,485	165,164	173,091
Concentrate ----	78,648	93,272	106,608
Cement, hydraulic ---- thousand tons --	[r] 6,493	7,024	7,940
Clays:			
Bentonite:			
Crude ----	472,229	384,408	428,466
Processed ----	15,603	318,046	246,308
Kaolin:			
Crude ----	76,130	82,753	72,140
Processed ----	12,194	18,515	16,881
Fertilizers, manufactured, gross weight:			
Nitrogenous ---- thousand tons --	255	361	283
Phosphatic ---- do ----	163	147	187
Potassic ---- do ----	[r] 20	30	23
Fluorspar ----	1,200	1,000	1,000
Gypsum and anhydrite ----	420,360	441,759	440,000
Magnesite:			
Crude ---- thousand tons --	1,068	1,369	1,426
Dead-burned ----	273,310	382,500	359,963
Caustic calcined ----	65,966	76,745	56,281
Perlite:			
Crude ----	247,948	213,017	158,074
Screened ----	125,712	114,195	105,580

See footnotes at end of table.

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

Commodity [1]	1973	1974	1975 [p]
NONMETALS—Continued			
Pozzolan (santorin earth)	723,665	820,735	857,944
Pumice	757,130	523,896	525,952
Pyrite, gross weight	[r] 314,401	255,414	188,257
Salt, all types ... thousand tons	114	[r] [e] 120	[e] 120
Silica (probably) silica sand	[r] 17,341	17,997	16,165
Stone, marble ... cubic meters	[r] 95,000	120,000	110,000
Sulfur, content of pyrite	[r] 141,480	114,936	84,716
Talc	5,251	4,320	5,860
MINERAL FUELS AND RELATED MATERIALS			
Coal, lignite ... thousand tons	[r] 13,212	14,109	17,600
Coke:			
Coke oven ... do	400	372	421
Gashouse ... do	10	[e] 10	[e] 10
Fuel briquets (lignite briquets) ... do	105	89	90
Gas, manufactured:			
Gasworks ... million cubic feet	353	320	NA
Blast furnaces ... do	8,408	7,652	NA
Coke ovens ... do	7,239	6,811	NA
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	6,562	7,098	7,149
Jet fuel ... do	3,632	2,384	5,152
Kerosine ... do	930	302	372
Distillate fuel oil ... do	23,641	22,111	21,932
Residual fuel oil ... do	34,865	35,178	36,150
Lubricants ... do	518	539	427
Other ... do	6,510	9,250	10,164
Refinery fuel and losses ... do	10,072	7,264	5,062
Total ... do	86,730	84,126	86,408

[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] Nickel content reported under nickel.

[3] Black sheet, galvanized sheet, and reinforcing bars only.

[4] Includes antimonial lead and hard lead.

[5] Includes powdered manganese in tons: 1973—none; 1974—1,122; 1975—3,908.

[6] Nickel plus cobalt contained.

TRADE

Upward expansion in mineral trade remained similar to that recorded during 1974, but the trade balance in minerals remained unfavorable. Greece was dependent on imports of high-rank fuels (crude oil and bituminous coal), iron and steel semimanufactured products, and nonferrous metals. Bauxite, nonmetallic minerals, and petroleum refinery products were the principal export items. European and Middle Eastern countries were Greece's principal trading partners. Tables 2 and 3 show mineral foreign trade of Greece for selected commodities.

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

Commodity	1973	1974	Principal destinations, 1974
Aluminum:			
Bauxite and concentrate thousand tons	1,369	1,457	U.S.S.R. 495; Romania 327; Netherlands 233.
Oxide and hydroxide	r 162,404	190,207	Netherlands 77,744; Spain 61,088; Romania 51,354.
Metal including alloys:			
Unwrought including scrap	r 105,473	102,465	Italy 47,658; France 32,069; Belgium-Luxembourg 17,508.
Semimanufactures	r 11,412	16,164	Italy 5,364; France 1,327; United States 1,090.
Antimony ore and concentrate	145	158	All to Belgium-Luxembourg.
Chromium, chromite	16,600	10,787	West Germany 4,950; Norway 3,212; Yugoslavia 1,500.
Copper:			
Matte	408	54	All to Belgium-Luxembourg.
Metal including alloys:			
Scrap	r 528	162	United Kingdom 90; Belgium-Luxembourg 49; France 21.
Unwrought	78	174	Belgium-Luxembourg 163.
Semimanufactures	2,351	2,938	West Germany 661; France 631; United States 485.
Iron and steel:			
Roasted pyrite	36,330	21,200	All to West Germany.
Metal:			
Scrap	r --	118	Netherlands 51; West Germany 37; Italy 30.
Ferroalloys, ferronickel	r 71,295	81,568	Sweden 32,997; West Germany 20,649.
Steel, primary forms	r 82,125	155,609	Spain 132,734; United States 12,700.
Semimanufactures:			
Bars, rods, angles, shapes, sections	r 42,720	105,826	Egypt 32,766; Yugoslavia 13,128; Libya 12,840.
Universals, plates, sheets	r 158,150	131,003	Yugoslavia 64,846; United States 27,443; Belgium-Luxembourg 13,894.
Hoop and strip	9,181	17,895	Yugoslavia 11,436.
Wire	5	340	Libya 314.
Tubes, pipes, fittings	r 19,133	29,699	Libya 18,137.
Castings and forgings, rough	--	332	Belgium-Luxembourg 148.
Lead:			
Ore and concentrate	16,000	28,480	Belgium-Luxembourg 14,000; Italy 9,600; Yugoslavia 4,880.
Metal including alloys, all forms	310	3,571	Spain 1,502; Italy 800; Turkey 502.
Manganese ore and concentrate	8,363	7,623	West Germany 3,430; France 2,693.
Silver metal including alloys thousand troy ounces	1,704	547	All to France.
Zinc ore and concentrate	43,266	51,289	Italy 21,350; Spain 12,920; France 11,700.
Other:			
Ores and concentrates	r 8,323	8,100	All to U.S.S.R.
Ash and residue containing nonferrous metals	r 13,641	26,274	Netherlands 23,389.
Waste and sweepings of precious metals	--	26	All to Belgium-Luxembourg.
NONMETALS			
Abrasives, natural, n.e.s., pumice, emery, natural corundum, etc	r 465,210	270,287	United States 192,381; West Germany 48,319.
Barite and witherite	r 69,042	101,811	United States 72,334; Nigeria 19,900.
Cement thousand tons	349	1,942	Libya 1,271; Algeria 312; Nigeria 205.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	r 317,426	364,097	Canada 123,007; Sweden 43,600.
Products:			
Refractory (including nonclay brick)	7,974	29,649	West Germany 9,271; Iran 6,410; Sweden 5,686.
Nonrefractory	13,601	25,133	Yugoslavia 15,859; Libya 3,774.
Fertilizer materials, manufactured:			
Nitrogenous	r 92,883	13,300	Cyprus 10,500; Tunisia 2,800.
Phosphatic	r 42,730	8,770	India 5,000; Turkey 3,770.
Other including mixed	r 136,410	6,332	All to Cyprus.
Gypsum plasters	--	5,168	All to Algeria.

See footnote at end of table.

Table 2.—Greece: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Lime	r 26,780	36,603	Libya 36,468.
Magnesite	370,838	437,392	West Germany 171,672; United States 83,600; Netherlands 49,032.
Mica, crude, including splittings and waste	3,419	4,722	All to Libya.
Sodium and potassium compounds, n.e.s., cautic soda	--	206	U.S.S.R. 200.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked, calcareous	37,488	35,419	Italy 12,473; West Germany 6,988; Libya 6,383.
Worked	5,045	34,074	Libya 30,667.
Gravel and crushed rock, n.e.s	4,496	32,974	Libya 32,206.
Quartz and quartzite	--	4,000	All to Yugoslavia.
Sulfur:			
Elemental, other than colloidal	r 21,999	10,125	Egypt 6,000; Turkey 2,000.
Sulfuric acid	r 66,329	35,724	Romania 22,787; Turkey 12,186.
Other nonmetals, n.e.s.:			
Crude	r 192,463	167,322	West Germany 51,825; United Kingdom 33,449.
Slag, dross and similar waste, not metal bearing	r 10,374	2,018	Italy 540; Belgium-Luxembourg 447; Republic of South Africa 202.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	32,740	46,625	Libya 13,285; Israel 12,605; Iraq 5,075.
MINERAL FUELS AND RELATED MATERIALS			
Coal	--	26,597	All to Italy.
Coke and semicoke	31,439	41,611	Romania 41,561.
Petroleum refinery products:			
Gasoline, motor thousand 42-gallon barrels	7,043	3,837	United Kingdom 1,629; West Germany 911; Belgium-Luxembourg 425.
Kerosine and jet fuel do	2,198	1,369	United Kingdom 277; Lebanon 183; United States 153.
Distillate fuel oil do	7,042	2,377	West Germany 1,109; United States 278; France 261.
Residual fuel oil do	r 8,225	4,740	Italy 948; Japan 632; Turkey 615.
Lubricants do	235	414	United Kingdom 139; United States 56; Trinidad and Tobago 45.
Liquefied petroleum gas do	23	48	Italy 16; Lebanon 15; Tunisia 15.

r Revised.

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

Commodity	1973	1974
METALS		
Aluminum:		
Oxide and hydroxide	r 1,160	NA
Metal including alloys:		
Scrap	--	325
Unwrought	1,684	1,767
Semimanufactures	2,298	2,238
Antimony metal including alloys, all forms	14	--
Chromium oxide and hydroxide	160	121
Copper:		
Matte	200	--
Copper sulfate	921	1,458
Metal including alloys:		
Scrap	56	120
Unwrought	18,490	15,236
Semimanufactures	1,246	1,184
Iron and steel:		
Ore and concentrate ---- thousand tons	856	1,025
Metal:		
Scrap	148,680	23,780
Pig iron, including cast iron	24,416	22,313
Sponge iron, powder, shot	765	667
Ferroalloys	7,397	12,932
Steel, primary forms	338,272	494,026
Semimanufactures:		
Bars, rods, angles, shapes, sections	r 275,286	208,058
Universals, plates, sheets	r 176,821	197,199
Hoop and strip	59,203	41,933
Rails and accessories	r 3,164	17,725
Wire	19,053	14,213
Tubes, pipes, fittings	r 30,800	28,154
Castings and forgings, rough	r 2,318	2,139
Lead:		
Ore and concentrate	16,007	4,848
Metal including alloys, unwrought and semimanufactures	18,931	15,463
Magnesium metal including alloys, unwrought	r 267	280
Manganese ore and concentrate	2,394	22,709
Nickel metal including alloys:		
Unwrought	32	38
Semimanufactures	403	308
Platinum-group metals and silver, including alloys:		
Platinum group ---- value, thousands	$395	$439
Silver ---- thousand troy ounces	2,958	2,186
Tin metal including alloys, unwrought and semimanufactures	r 405	506
Titanium oxides	6,147	4,649
Tungsten metal including alloys, all forms	r 2	1
Zinc:		
Oxide	572	537
Metal including alloys:		
Unwrought	14,705	11,363
Semimanufactures	151	140
Other:		
Ores and concentrates, n.e.s	1,302	2,556
Ash and residue containing nonferrous metals, n.e.s	140	317
Oxides, hydroxides and peroxides of metals, n.e.s	r 89	NA
Metals including alloys, all forms:		
Metalloids	270	288
Alkali, alkaline earth and rare-earth metals	5,489	5,864
Base metals including alloys, all forms, n.e.s	r 59	37
NONMETALS		
Abrasives, natural, n.e.s.:		
Dust and powder of precious and semiprecious stones ---- value, thousands	r $1,591	--
Grinding and polishing wheels and stones	523	466
Asbestos	14,339	19,371
Boron materials:		
Crude natural borates	798	NA
Oxide and acid	285	NA
Cement	2,051	701
Chalk	1,054	NA
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	r 89,678	104,457
Products:		
Refractory (including nonclay brick)	27,923	29,710
Nonrefractory	5,736	3,996
Diatomite and other infusorial earth	313	NA

See footnotes at end of table.

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

Commodity	1973	1974
NONMETALS—Continued		
Feldspar and fluorspar	r 4,745	7,183
Fertilizer materials:		
Crude:		
Phosphatic	413,066	330,376
Other	r 991	--
Manufactured:		
Nitrogenous	33,247	14,335
Potassic	27,049	11,070
Other, including mixed	2,512	2,303
Ammonia	37,624	NA
Graphite, natural	r 321	NA
Gypsum and plasters	r 1,639	NA
Magnesite	2,327	1,475
Pigments, mineral, processed iron oxides	1,690	1,818
Precious and semiprecious stones, except diamond, natural -- kilograms	5,000	2,000
Pyrite (gross weight)	147,689	118,868
Salt	61,393	51,151
Sodium and potassium compounds, n.e.s.:		
Caustic soda	34,614	35,977
Caustic potash, sodic and potassic peroxides	286	NA
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	810	NA
Worked	222	362
Dolomite, chiefly refractory grade	2,441	NA
Other calcareous stone, n.e.s	40	NA
Gravel and crushed rock, n.e.s	1,166	NA
Sand, excluding metal bearing	84,259	84,860
Sulfur, elemental, other than colloidal	r 128,963	214,048
Talc, steatite, soapstone, pyrophyllite	3,259	2,092
Other nonmetals, n.e.s.:		
Crude	735	NA
Oxides and hydroxides of magnesium, strontium and barium	116	NA
Building materials of asphalt, asbestos, fiber cement, and unfired nonmetals, n.e.s	940	603
MINERAL FUELS AND RELATED MATERIALS		
Carbon black	2,644	3,202
Coal and briquets:		
Anthracite and bituminous coal	650,600	840,688
Briquets of coal	r --	2,625
Coke and semicoke	44,906	43,086
Hydrogen, and rare gases	r 243	NA
Petroleum:		
Crude and partly refined -- thousand 42-gallon barrels	r 90,648	88,904
Refinery products:		
Gasoline (including natural) -- do	1,417	107
Kerosine -- do	1,497	1,252
Distillate fuel oil -- do	2,891	1,086
Residual fuel oil -- do	2,984	1,554
Lubricants -- do	r 684	567
Mineral jelly and wax -- do	7	9
Other:		
Liquefied petroleum gas -- do	306	329
Nonlubricating oils, n.e.s -- do	r 8	NA
Pitch and pitch coke -- do	r 780	404
Bitumen and other residues -- do	493	285
Bituminous mixtures, n.e.s -- do	r 3	--
Other -- do	--	12
Total -- do	r 11,070	5,605
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 9,533	10,982

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Inauguration of a new alumina plant and expansion of existing aluminum facilities were the highlights of the aluminum industry during 1975. The aim was to increase foreign exchange earnings by changing the status of Greece from a bauxite producer and exporter to a bauxite processor and exporter of alumina and aluminum. Although Greece produced over 3 million tons of bauxite, production of alumina and aluminum for the past several years averaged only 500,000 and 136,000 tons, respectively. At yearend, Aluminium de Grèce S.A. (ADG) received approval from the Government for an $18 million expansion project to improve and modernize its plant at Aghios Nicolaos, Boeotia.

Greece's largest bauxite mining company, Bauxites Parnasse Mining Co., planned construction of a 600,000-ton-per-year alumina plant near Itea (Corinthian Gulf) with a provision to double its capacity. Hungarian technology was to be used. Chase Manhattan Bank was arranging a financial package and foreign participation for an initial investment of $200 million and an additional $100 million for expansion. Bauxites Parnasse and HIMIC will control 51% of the equity in the corporation to be created to carry out the project. In addition, the Bauxites Parnasse announced plans for increasing its annual production from 2 million tons to 3.2 million tons by investing $10 million in expansion of its mining facilities in the Parnassos-Ghiona areas. At yearend, governmental approval was reportedly imminent for these projects. A pilot plant for producing alumina from alunite on the island of Milos was contemplated by Bauxites Hellas S.A. and the Scalistiri Mining Group. A 1,500-ton-per-day bauxite crushing and screening unit started production at Aghia Marina, Stylis, near Lamia, processing bauxite from Oiti Mountain. Eleusis Bauxite Mines Inc. (Scalistiri Group) managed the project.

Iron and Steel.—The Greek Ministry of Industry announced preliminary results of exploration for metals on Thassos, an island in the Aegean Sea. Reportedly, 10 million tons of iron ore was discovered. The grade of ore was not made public.

The domestic iron and steel industry, although modest by world standards, was an important factor in the country's economy. The only integrated steel producer in the country remained Halyvourgiki, Inc., with its plant near Eleusis, which accounted for about 60% of the country's steel production. About 40% to 50% of Greece's steel demand has been met by imports in recent years. Shipbuilding remained the principal use for steel.

Gold.—One gold mine near Servia, Kozani, went onstream in October of 1975. This was the first mine in production of a total of three new mines planned for the area by Greek Gold Mines S.A., in which the Masivor Corp. of Canada had invested $600,000. Expected production of gold was not made public.

Manganese.—Production started at a new manganese dioxide (battery grade) grinding and packing facility at the Drama manganese mine, owned by Financial Mining and Industrial Shipping Corp. (FIMISCO).

Nickel.—During 1975, Société Minière et Métallurgique de Larymna (LARCO) S.A. announced plans for a $50 million improvement and expansion of installed nickel producing capacity near Larymna from the present 15,000 tons to 27,000 tons to be completed by 1978. To meet the new demand of the smelter, mining output of the nearby mine would have to double. LARCO planned to provide financing of $17 million from its own funds, while about $33 million would be borrowed abroad. At yearend, approval for this project from the Government of Greece was imminent. In addition, LARCO was planning a subsequent $170 million investment to establish an additional 13,000-ton-per-year nickel plant nearby, bringing the company's annual capacity to 40,000 tons of nickel.

Preliminary work for development of nickel laterite deposits and construction of a ferronickel plant in the Psachna area, Central Euboea, continued. Eleusis Bauxite Mines—Mining Industrial and Shipping, Inc. (Eleusis), planned to invest $65 million in the project. Production of 10,000 tons of nickel and 40,000 tons of ferronickel was to start in 1980. Elkem A/S of Norway was assisting in carrying out laboratory and pilot tests. A contract for engineering and management of the project was signed with Bechtel Corp. of the United States. Construction also started on a pilot plant for heavy media treatment of lateritic ores; equipment was of French design.

NONMETALS

Asbestos.—At yearend, contract revision negotiations continued between ETVA and Cerro Corp. over their partnership in developing the Zindanion asbestos deposit near Kozani. At yearend, the principal point of disagreement was over equity distribution, with ETVA insisting on 51% participation.

Cement.—During 1975, annual cement producing capacity reached 9.1 million tons, and the cement industry invested about $62 million in new installations. A new cement plant, with a capacity of 1 million tons per year, went onstream at Kamari, Boeotia (Titan Cement Co). Construction continued on the General Cement Co. Ltd., (AGET) 1.5-million-ton-per-year plant at Volos and on the Chalkis Cement Co. S.A. 1-million-ton-per-year cement plant near Chalkis. Completion of these two plants was scheduled for 1976, at which time the cement producing capacity of Greece would be 11.7 million tons. Furthermore, the Government of Greece authorized investments, totaling $300 million, in six new cement plants. No locations or capacities for the new plants were mentioned. Domestic cement consumption improved slightly, but for the cement industry, the large increase of cement exports, about 50% more during 1975 than during 1974, was particularly important.

Magnesite.—During 1975, magnesite remained among the most active mineral commodities in Greece.

FIMISCO obtained approval to invest $50 million in construction of a 100,000-ton-per-year refractory magnesia from seawater and dolomite plant at Euoboea, with an eventual expansion to 200,000 tons per year. The plant will be constructed under license from and with technical assistance from Harbison-Walker Refractories International, Div. of Dresser Industries, Inc. Fluor Utah supplied engineering services related to the feasibility study. Start of construction was planned for 1976, and completion was expected in 1979. In addition, FIMISCO expected to complete construction of a new flotation plant for beneficiation of low grade ores by 1976.

The Macedonian Magnesite Mining—Industrial Shipping Corp. (Macedonian Magnesite), of the Scalistiri Group, completed construction of one 50,000-ton-per-year and one 70,000-ton-per-year rotary kiln at Mantoudi, Euoboea. By 1977, the Scalistiri Group as a whole will have an annual capacity for production of 450,000 tons of dead-burned magnesite and 100,000 tons of magnesite from seawater.

A local subsidiary of General Refractories, Inc. (United States), Magnomin General Mining Company S.A., had a program underway to increase its annual production capacity for dead-burned magnesite from 50,000 tons to 120,000 tons. In addition, the company was planning annual production of 16,000 cubic meters of insulating board.

Grecian Magnesite Ltd. expanded its mining, ore dressing, and sintering installations at Gerakini, Chalkidiki. At the mine site a new 180-ton-per-day rotary kiln and eight automatic ore screeners started production in 1975.

Development of the "Troupi" mine, located in north Euboea, continued. Magnesite Mining Industrial and Commercial S.A. completed civil engineering work and started installation of an 87,000-ton-per-year magnesite dressing plant and a 35,000-ton-per-year rotary kiln for dead-burned magnesite. Start of production at the mine, ore dressing plant, and rotary kiln was planned for 1976.

MINERAL FUELS

Imported petroleum remained the principal source of energy in Greece. During 1974, the latest year for which complete data were available, about 94% of Greece's apparent energy consumption was met through imports. Crude oil and refinery products accounted for approximately 95% of primary energy imports. Coal was the principal source of energy produced in the country and provided 22% of apparent energy consumption. However, additional imports of high-rank coals were necessary to meet demand. Table 4 shows supply and apparent consumption of energy producing materials for 1973 and 1974 in million tons of standard coal equivalent (SCE).

Table 4.—Greece: Supply and apparent consumption of energy-producing materials in 1973 and 1974
(Million tons of standard coal equivalent) [1]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Fuelwood	Hydro-electric power	Nuclear power
1973:							
Production	4.6	4.3	--	--	(2)	0.3	--
Imports	20.7	.7	20.0	--	(2)	(2)	--
Exports	5.7	(2)	5.7	--	(2)	(2)	--
Apparent consumption	20.3	5.0	15.0	--	(2)	.3	--
1974:							
Production	4.9	4.6	--	--	(2)	0.3	--
Imports	20.5	1.0	19.5	--	(2)	(2)	--
Exports	3.6	(2)	3.6	--	(2)	(2)	--
Apparent consumption	21.8	5.6	15.9	--	(2)	.3	--

[1] 1 ton of standard coal equivalent (SCE) =7,000,000 kilocalories.
[2] Less than ½ unit.

Source: Adapted from United Nations, World Energy Supplies 1950–1974, Statistical Papers, Ser. J, No. 19, 1976, 825 pp.

Coal.—Lignite was the most important mineral fuel produced in Greece in 1975, and exploration for further deposits continued. The National Institute for Geological Research conducted exploration with funds supplied by the Public Power Corp. (PPC).

The NEB was to investigate use of lignite in production of fertilizers and manufactured gas; during 1975, most lignite was used for the production of electric power.

Petroleum and Natural Gas.—While Greece continued efforts to develop production of crude oil, imports remained the principal source of supply during 1975. With an installed petroleum throughput capacity of 19.7 million tons, at four refineries, Greece had surplus capacity and exported about two-thirds of its output of petroleum products.

Exploration for crude oil and natural gas was carried out both offshore and onshore. Following revision of its agreement with the Government of Greece, the Oceanic Exploration Co. of Denver resumed offshore drilling operations in the area of Thassos Island, and a third well was completed at yearend. Based on preliminary results of laboratory tests, the oil from this well was heavy and had a high sulfur content. Preliminary evaluation of the find indicated that available reserves could sustain a production of about 2.5 million tons of oil per year for 15 years. While drilling continued, local authorities started studies for a new city for future production workers in the Thassos oilfield.

A Houston firm, Rogers Exploration, Inc., completed seismic exploration at the Nestos River delta in northern Greece. In November 1975, the PPC, which financed the exploration, invited drilling contractors to offer bids for two 2,500-meter exploratory wells in the Nestos River delta. Opening of bids was scheduled for early 1976.

Uranium and Nuclear Energy.—The Democritus Research Center conducted uranium exploration programs in eastern Macedonia and Thrace. At yearend, no exploitable deposits had been discovered, but some preliminary results were encouraging. In 1975, the participation of the United Nations Development Program (UNDP) in training Greek personnel for uranium exploration, was extended through 1976.

The Mineral Industry of Hungary

By Nikita Wells [1]

Hungary's only significant mineral resource by world standards is bauxite, production of which represented 3.8% of the world total in 1975. Mineral fuels, iron, and steel, are next in importance to the domestic economy. Owing to its relatively poor raw material base, Hungary has to rely heavily on imports, two-thirds of which came from the U.S.S.R. and other centrally planned economy countries in 1975.

Reportedly, Hungary's gross national product (GNP) reached 402 billion forints (Ft) [2] an increase of 6.6% over that of 1974. The rise in industrial production slowed considerably in 1975 to 4.8% as the industrial share of the GNP reached 45% of the total output. The work force employed in industry was 1,794,000 persons, relatively unchanged compared with that of 1974. Most of the major investment projects scheduled for completion in 1975 were terminated by yearend, but some of them did not attain design capacities or were completed later than planned.

In 1975, the total electric generating capacity increased 750 megawatts. The Soviet-Hungarian Brotherhood natural gas pipeline was completed from the Soviet border to Zsámbok, and a long-distance, 400-kilovolt cable was built between Györ and Litér. The second section of the Rákhegy bauxite mine, with a capacity of 125,000 tons per year, was opened during 1975. The Hejöcsaba cement factory became operational during the year with an annual capacity of 1.6 million tons of portland cement. A rod and wire mill was put into operation at Ozd and a steel-alloy rolling mill went into production on an industrial scale at the Lenin metallurgical works. A new fertilizer section was commissioned at the Pet nitrogen works at yearend.

Government Policies and Programs.—The fifth Hungarian 5-year plan (for the period 1976–80) provides for a total investment of Ft 870 billion ($21.750 million). Of this total investment, 40% or $8,700,000 is earmarked for industry and is to be distributed as follows, in percent:

Mining	13.0
Electric energy industry	19.7
Metallurgy	7.9
Chemical industry	14.7
Building materials	8.5
Machine building	14.1
Light industries	8.8
Food processing	9.9
Other	3.4
Total	100.00

Compared with the preceding 5-year plan, more investment funds are being allocated to mining (bauxite and coal), energy production (thermal and nuclear power), and the chemical industry. In the other industrial sectors, planned investments generally involve purchases of special machinery and equipment.

By 1980, the proportion of hydrocarbons in the total domestic energy consumption is to increase to approximately 65%. The quantity of natural gas to be made available for consumption in 1980 is about 10 billion cubic meters, of which 6 billion is to be produced in Hungary. The capacity of the Brotherhood gas pipeline is to be increased to transport more gas from the

[1] Physical scientist, International Data and Analysis.

[2] Hungarian forints (Ft) have not been converted into U.S. dollars owing to the wide variation between the official exchange rate (Ft 8.51 =US$1.00 in 1975) and the values used for some transactions. The tourist rate was Ft 20.44=US $1.00. At the beginning of 1976, the commercial or foreign-trade multiplier rate of Ft 41.70= US$1.00 was adopted. This is the rate at which Hungarian firms obtain foreign currency for purchases abroad or are reimbursed for convertible currency.

U.S.S.R. At least 2 million tons of crude oil is to be produced annually during the 1976–80 5-year plan, and crude oil imports are also to be increased. Mechanization of coal mines is to be increased, and the production of coal is to reach 23.5 million to 24.5 million tons per year by 1980. New coal production facilities are to be established to supply coal-fired powerplants that will be going into operation after 1980. The capacity of electric powerplants is to increase 1,500 megawatts by 1980 to meet the country's electric energy requirements. The construction of the Dunamenti Höerömu powerplant is to be completed, and the Tiszai Höerömu powerplant is to be put into operation. By the end of the plan period, the first reactor unit of the Paks nuclear powerplant is to go into operation. The 750-kilovolt transmission line between Vinitsa and Albertirsa is to be completed with the cooperation of other COMECON[3] countries.

Crude steel production in 1980 is to be raised to 4.3 million to 4.5 million tons per year, and rolled steel production is to be 3.1 million to 3.3 million tons per year. The manufacture of high-alloy steel, alloy steel products, steel plates, and steel for concrete reinforcement is to increase. A new coking plant is to be built in Dunaújváros, and a new converter is to be installed at the Lenin Iron and Steel Works in Miskolc-Diósgyor. In the aluminum industry, annual production in 1980 is to reach 3.0 million to 3.1 million tons of bauxite, about 800,000 tons of alumina, and 72,000 to 73,000 tons of aluminum ingots. A special effort is to be made in the processing of aluminum. The capacity of the Szekesfehervar Light-Metal Works is to be expanded. During this plan period, research and development work for deep-mining copper in Recsk is to be initiated; this is to be followed by the construction of downstream facilities during the 1981–85 plan period.

In the chemical industry, nitrogen fertilizer production in 1980 is to reach 710,000 to 720,000 tons (nitrogen equivalent) per year. In the building-material industry, annual cement production is to be 5.4 million to 5.6 million tons. The construction of the Bélapátfalva cement plant is to be completed by 1980.

PRODUCTION

Hungary's production in the mineral and related industries in 1975, compared with that of 1974, was as follows:

Industrial Sector	*Percent of 1974 figure*
Mining	105.4
Electric energy industry	105.5
Metallurgy	99.7
Chemical industry	108.3
Building materials	105.4

Output by the entire metallurgy sector declined slightly, but the output of ferrous metals increased. Crude steel production in 1975 went up 5.9%, and rolled steel products, 11.8%, compared with that of 1974. Pig iron production, however, decreased 3.1%. In nonferrous metals, production of aluminum increased 1.7%; alumina, 9.4%; and bauxite, 5.0% compared with 1974.

In the nonmetal sector, cement production showed an increase of 9.4% over that of 1974 as the Hejöcsaba cement factory went into operation. Nitrogen and phosphatic fertilizer production (nutrient content) increased 7.1% and 8.4%, respectively. In mineral fuels, total coal production decreased 3.4% in 1975, owing mainly to small mines closing. Natural gas production showed a 1.6% increase, while crude oil production was barely 0.5% greater than in 1974. Hungary does not report the production statistics of some of its mineral commodities, and therefore some of the data presented in the production table (table 1) are estimates.

[3] COMECON—the Council for Mutual Economic Assistance—comprises the following countries: Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.

Table 1.—Hungary: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum:			
Bauxite ---thousand tons--	2,600	2,751	2,889
Alumina ---do----	655	691	756
Metal, primary ---	67,885	69,043	70,221
Copper:			
Mine output, metal content [e] ---	1,200	1,200	1,000
Metal:			
Smelter, primary [e] ---	1,200	1,200	1,000
Refined, including secondary ---	[e] 17,000	[e] 14,000	13,010
Gold, mine output ---troy ounces--	[e] 320	[e] 320	161
Iron and steel:			
Iron ore ---thousand tons--	681	545	642
Pig iron:			
Pig iron for steel ---do----	2,002	2,217	2,142
Pig iron for foundries ---do----	[r] 85	73	77
Total ---do----	[r] 2,087	2,290	2,219
Ferroalloys ---do----	23	8	7
Crude steel ---do----	3,327	3,468	3,673
Steel semimanufactures, rolled only ---do----	2,280	2,392	2,675
Lead:			
Mine output, metal content ---	[e] 2,500	[e] 1,600	716
Metal, refined, secondary ---	8,000	13,500	[e] 13,000
Manganese ore [2] ---thousand tons--	136	114	131
Silver ---thousand troy ounces--	[e] 64	[e] 64	67
Zinc:			
Mine output, metal content ---	4,000	2,700	2,200
Smelter, secondary ---	607	701	680
NONMETALS			
Cement, hydraulic ---thousand tons--	3,405	3,437	3,759
Clays:			
Bentonite ---do----	73	77	88
Kaolin, crude and washed ---do----	83	79	89
Fertilizer materials, manufactured:			
Nitrogenous:			
Gross weight ---do----	1,969	1,918	2,056
Nitrogen content ---do----	404	393	421
Phosphatic:			
Gross weight ---do----	1,004	1,021	1,090
Phosphorus pentoxide content ---do----	190	190	206
Lime, calcined ---do----	669	636	714
Perlite ---do----	96	93	72
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--	172	175	171
Chrome magnesite products ---do----	45	47	42
Sand and gravel:			
Gravel ---thousand cubic meters--	10,701	11,602	11,860
Sand, common ---do----	339	417	437
Sand, moulding ---thousand tons--	553	467	710
Stone:			
Dimension, all types ---do----	3	5	4
Other:			
Dolomite ---do----	840	960	1,089
Limestone ---do----	6,895	7,067	7,510
Quartzite ---do----	34	29	33
Sulfur:			
Elemental, byproduct ---	8,648	9,391	8,937
Sulfuric acid ---thousand tons--	648	657	630
Talc [e] ---do----	16	16	16
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [e] ---	[r] 4,500	[r] 4,500	4,500
Coal:			
Bituminous ---thousand tons--	3,410	3,209	3,020
Brown ---do----	15,463	15,281	14,963
Lignite ---do----	7,908	7,271	6,904
Total ---do----	26,781	25,761	24,887
Coke:			
Coke oven coke ---do----	603	639	593
Gas coke ---do----	[r] 478	401	407
Total ---do----	[r] 1,081	1,040	1,000
Fuel briquets ---do----	1,060	1,114	1,082

See footnotes at end of table.

Table 1.—Hungary: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Gas:			
Manufactured .... million cubic feet..	25,250	23,519	22,495
Natural, marketed .... do....	170,251	180 139	183,000
Natural gas liquids:			
Natural gasoline .... thousand 42-gallon barrels..	374	672	757
Liquefied petroleum gas .... do....	951	1,032	1,299
Peat (agricultural use) e .... thousand tons..	65	65	65
Petroleum:			
Crude:			
As reported .... do....	1,989	1,997	2,006
Converted .... thousand 42-gallon barrels..	15,176	15,237	15,306
Refinery products: [3]			
Gasoline, including naphtha .... do....	10,846	11,424	16,142
Kerosine .... do....	--	8	8
Distillate fuel oil .... do....	r 21,462	23,932	25,938
Residual fuel oil .... do....	r 19,221	20,067	22,870
Lubricants .... do....	1,198	1,392	1,321
Other:			
Liquefied petroleum gas .... do....	870	974	1,032
Asphalt and bitumen .... do....	r 3,224	3,563	3,691
Paraffin and petrolatum .... do....	r 194	196	170
Total .... do....	r 57,015	61,556	71,172

e Estimate. p Preliminary. r Revised.

[1] In addition to the commodities listed, diatomite, gypsum, and other crude construction materials, such as common clay, 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

The value of Hungary's total trade turnover (exports plus imports) reached Ft 113.7 billion in 1975, an increase of 16.1% over that of 1974. Hungarian exports amounted to Ft 52.2 billion, an 11.3% increase over that of 1974; imports amounted to Ft 61.5 billion, an increase of 20.6%. In 1975, Hungary's trade with the centrally planned economy countries amounted to Ft 78.1 billion, while trade with market economy countries was Ft 35.6 billion. Hungarian mineral and fuel exports represented FT 14.2 billion, or 27.2% of the total exports. The mineral and fuel imports reached Ft 37.4 million, or 60.8% of the imports.

During the last 5 years, Hungary has built up an adverse foreign trade balance of Ft 13.0 billion (foreign-exchange conversion rate) owing to the large volume of imports compared with exports, and the price increase of imported fuels and other raw materials. The main objective in the 1976–80 5-year plan is to decrease this deficit.

Hungary's major trading partners in 1975 are shown in the following tabulation, in order of value:

Country	Exports (million forints)	Percent of total trade	Imports (million forints)	Percent of total trade
U.S.S.R.	20,278	38.9	21,504	34.9
Germany, East	5,649	10.8	6,363	10.3
Czechoslovakia	4,371	8.4	4,606	7.5
Germany, West	2,729	5.2	4,400	7.2
Poland	2,727	5.2	3,027	4.9
Other	16,417	31.5	21,637	35.2
Total	52,171	100.0	61,537	100.0

Hungary's limited mineral exports in 1975 consisted mainly of bauxite, alumina, aluminum, aluminum products, and some steel semimanufactures. Since Hungary is poor in fuels and other raw materials, it relied a great deal on imports. The imports included bituminous coal and anthracite, coke, crude oil and petroleum products, natural gas, iron ore, pig iron, steel and steel manufactures, nonferrous metals, and nonferrous metal products.

Hungary had signed a number of agreements with the U.S.S.R. that showed the intensified trade relations between the two countries and the expanded rôle of the U.S.S.R. in Hungarian foreign trade in mineral commodities. Under an agreement covering 1976–80, the U.S.S.R. is to increase its crude oil deliveries by 200,000 tons each year. In return, Hungary is to supply industrial machinery and products to be used in expanding Soviet oil output. Increasing exports of alumina are to be returned to Hungary after processing in the form of aluminum slabs and ingots. A new agreement was also signed under which the U.S.S.R. is to supply major items of equipment for 25 Hungarian projects between 1976 and 1980 in the fields of energy, metallurgy, oil processing, telecommunications, and the chemical industry.[4]

[4] Világgazdazág (Budapest). Feb. 4, 1976.

Table 2.—Hungary: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite [3]	659	559	Czechoslovakia 266; East Germany 180.
Alumina: [3]			
Hydrate	--	7,255	Finland 5,829; Yugoslavia 1,359.
Calcined	598,304	626,292	U.S.S.R. 331,646; Poland 152,400; Austria 96,415.
Metal, including alloys:			
Scrap [3]	24,305	19,784	Austria 9,053; Italy 8,984.
Unwrought [3]	86,256	54,727	Austria 6,254; Finland 4,938.
Semimanufactures [3]	24,537	30,725	Romania 9,661; East Germany 5,693; Czechoslovakia 3,215.
Chromium oxide and hydroxide	117	150	Italy 75; Yugoslavia 75.
Copper metal including alloys:			
Ore and concentrate	NA	448	All to Belgium-Luxembourg.
Scrap	2,248	1,556	West Germany 1,271; Austria 145.
Unwrought and semimanufactures	13,236	7,003	West Germany 1,854; Israel 1,046; Italy 985.
Iron and steel:			
Scrap ---thousand tons	128	102	Italy 56; Yugoslavia 35; West Germany 9.
Pig iron and ferroalloys [3] ---do	207	281	Japan 100; Italy 59; Austria 38.
Steel, primary forms [3] ---do	r 172	175	Austria 66; Yugoslavia 39.
Semimanufactures [3] ---do	971	607	Poland 103; Italy 49.
Castings and forgings, rough [3] ---do	16	18	Poland 4; Italy 3.
Lead:			
Ore and concentrate	2,796	2,445	All to Belgium-Luxembourg.
Oxides	260	550	All to Italy.
Metal including alloys, all forms	1,079	461	Yugoslavia 253; Austria 127.
Manganese ore and concentrate [3]	14,052	15,173	Czechoslovakia 11,997; West Germany 3,176.
Nickel metal including alloys, all forms	871	485	Netherlands 179; West Germany 137; Sweden 79.
Platinum-group metals:			
Waste and sweepings value, thousands	$1,526	$2,456	Mainly to West Germany.
Metal including alloys, ---do	NA	$248	Italy $212; West Germany $36.
Silver:			
Metal including alloys ---do	NA	$36	Mainly to Austria.
Tin metal including alloys	--	60	Netherlands 40; Denmark 20.
Tungsten [4] ---value, thousands	NA	$27	NA.
Zinc:			
Ore and concentrate	5,736	NA	
Oxide	--	122	All to West Germany.
Metal, all forms	274	([5])	NA.
Other:			
Ore and concentrate [3]	--	6,825	Poland 4,204; Belgium-Luxembourg 2,621.
Ash and residues containing unspecified nonferrous metals	18,437	11,779	Austria 7,569; West Germany 2,536; Belgium-Luxembourg 1,495.
Base metals including alloys, all forms, n.e.s	2	34	West Germany 28; Netherlands 6.
NONMETALS			
Asbestos	NA	2,282	Belgium-Luxembourg 1,291; West Germany 991.
Cement, hydraulic [3] ---thousand tons	72	33	Czechoslovakia 23; Bulgaria 5.

See footnotes at end of table.

Table 2.—Hungary: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal destinations, 1974
NONMETALS—Continued			
Clays and clay products:			
Crude clays, n.e.s.: [3]			
Bentonite	23,379	23,080	East Germany 15,643; Poland 3,977.
Fire clay	NA	986	Bulgaria 924; Poland 61.
Kaolin	NA	8,350	Czechoslovakia 4,334; East Germany 2,665; Romania 991.
Products:			
Refractory (including nonclay bricks) [3]	31,427	31,112	West Germany 7,138; Romania 5,234; Italy 4,832.
Nonrefractory	NA	71,689	Mainly to Yugoslavia.
Cryolite and chiolite	NA	485	All to United States.
Diamond:			
Gem ____value, thousands	$727	$745	All to Belgium-Luxembourg.
Industrial ____do	NA	$74	Do.
Diatomite and other infusorial earth	1,651	3,382	All to Austria.
Fertilizer materials:			
Manufactured, unspecified [3]	231,730	NA	
Ammonia	-23,238	31,123	Yugoslavia 26,218; France 2,896.
Magnesite [3]	--	8,990	Italy 2,543; West Germany 1,762; Romania 1,568.
Pigments, mineral, including iron oxides	--	245	Yugoslavia 125; Italy 120.
Stone, sand and gravel:			
Dimension stone	517	514	All to Austria.
Gravel and crushed rock	54,693	97,663	All to Yugoslavia.
Limestone	25,008	18,347	Do.
Sand, excluding metal bearing [3]	23,803	53,396	Yugoslavia 31,831; Austria 21,512.
Sulfur:			
Elemental	--	1,201	All to Yugoslavia.
Sulfuric acid [3]	81,425	99,449	Yugoslavia 67,333; Romania 29,550.
Other:			
Slag, dross, and similar waste, not metal bearing	NA	32,526	Yugoslavia 28,696; Italy 3,830.
Crude	31,263	39,803	Austria 14,064; West Germany 13,305; Yugoslavia 8,729.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	1,174	NA	
Coal and briquets: [3]			
Anthracite and bituminous coal thousand tons	--	6	All to Austria.
Briquets of anthracite and bituminous coal ____do	NA	63	Mainly to Yugoslavia.
Lignite ____do	62	68	Austria 34; U.S.S.R. 28; Yugoslavia 6.
Coke from bituminous coal [3] ____do	80	43	Yugoslavia 16; Austria 14; Italy 13.
Gas, natural [3] ____million cubic feet	NA	228	U.S.S.R. 156; Czechoslovakia 72.
Peat and peat briquets [3]	NA	2,922	Yugoslavia 2,131; Austria 636.
Petroleum:			
Crude and partly refined [3] thousand 42-gallon barrels	r 14	121	U.S.S.R. 26; United Kingdom 17; East Germany 15.
Refinery products:			
Gasoline ____do	2,199	38	All to Austria.
Kerosine [3] ____do	14	--	
Distillate fuel oil [3] ____do	90	85	Mainly to U.S.S.R.
Residual fuel oil [3] ____do	1,444	687	All to Austria.
Lubricants [3] ____do	2	396	Austria 251; Poland 65; Yugoslavia 32.
Other:			
Mineral jelly and wax [3] do	153	153	Italy 50; Austria 21.
Nonlubricating oils, n.e.s do	NA	327	Mainly to West Germany.
Bitumen [3] ____do	313	396	Poland 151; Austria 122; West Germany 57.
Liquefied petroleum gas [3] do	NA	117	Austria 68; Italy 15; West Germany 14.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	4,009	874	Netherlands 504; France 229; West Germany 141.

r Revised. NA Not available.

[1] Compiled from the 1973 edition of the World Trade Annual, v. 1–3, Walker and Company, New York, 1975, unless otherwise noted.

[2] Compiled from the 1974 edition of the Supplement to the World Trade Annual, v. 1 (Eastern Europe), Walker and Company, New York 1976 (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.

[3] Source: Official Hungarian statistics.

[4] Some molybdenum and tantalum may also be included.

[5] Valued at $37,000.

Table 3.—Hungary: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal sources, 1974
METALS			
Aluminum:			
Oxide and hydroxide [3]	344,947	323,076	Mainly from U.S.S.R.
Metal including alloys, all forms [4]	140,956	98,993	Do.
Chromite	10,000	18,000	All from U.S.S.R.
Cobalt, oxides and hydroxides	17	--	
Copper:			
Copper sulfate [3 4]	6,124	6,113	U.S.S.R. 5,896.
Metal including alloys, all forms	35,322	40,871	U.S.S.R. 33,128.
Iron and steel: [4]			
Ore and concentrate__thousand tons	3,712	4,105	Mainly from U.S.S.R.
Pig iron, ferroalloys and similar materials __do	r 265	321	U.S.S.R. 293.
Steel, primary forms __do	109	94	Yugoslavia 42; East Germany 23; Austria 15.
Semimanufactures __do	1,061	880	U.S.S.R. 579; Poland 89; Czechoslovakia 88.
Lead:			
Oxides	1,050	887	Austria 477; France 310; Netherlands 100.
Metal including alloys, all forms [3 4]	12,991	11,795	U.S.S.R. 11,101.
Magnesium metal including alloys, all forms [3]	350	501	All from U.S.S.R.
Manganese ore [4]	NA	14,614	Do.
Mercury __76-pound flasks	812	406	Italy 203; Yugoslavia 203.
Molybdenum metal including alloys, all forms	20	66	United Kingdom 30; Austria 25; Japan 9.
Nickel metal including alloys, all forms	148	69	West Germany 39; Switzerland 15; Sweden 8.
Platinum-group metals including alloys value, thousands	$2,251	$1,611	All from West Germany.
Silver metal including alloys __do	$2,481	$6,844	Mainly from United Kingdom.
Tantalum metal, all forms __do	NA	$35	NA.
Tin:			
Oxide	22	12	All from West Germany.
Metal including alloys	1,205	45,805	Mainly from United Kingdom.
Titanium oxides	4,024	4,913	Italy 2,700; West Germany 2,063.
Tungsten metal, all forms	NA	4	United Kingdom 3; Austria 1.
Zinc:			
Oxide	546	492	Italy 230; United Kingdom 222.
Metal, all forms [3 4]	r 20,710	12,508	U.S.S.R. 6,952; Yugoslavia 1,975; West Germany 1,501.
Other:			
Ores and concentrates, n.e.s [4]	15,988	29,611	U.S.S.R. 18,430; Albania 10,033.
Metals including alloys:			
Metalloids, n.e.s	520	856	Norway 670; Yugoslavia 183.
Base metals, n.e.s	67	106	Belgium-Luxembourg 71; United Kingdom 17.
NONMETALS			
Abrasives, natural, grinding and polishing wheels and stones [3 4]	r 682	2,552	Iceland 1,739; Austria 340.
Asbestos [3 4]	21,601	26,233	U.S.S.R. 26,032.
Barite and witherite	10,198	19,191	Yugoslavia 15,251; Ireland 3,300.
Cement, hydraulic [4] __thousand tons	1,289	974	U.S.S.R. 680.
Clays and clay products:			
Clays: [4]			
Fire	72,055	70,720	Czechoslovakia 65,702.
Kaolin	22,019	24,423	Bulgaria 8,916; Czechoslovakia 7,815; East Germany 7,472.
Other, crude, n.e.s	61,339	NA	
Products:			
Refractory [3 4]	87,784	17,268	U.S.S.R. 7,611; Austria 5,092; West Germany 3,292.
Nonrefractory	--	2,615	Italy 1,884; West Germany 468; Sweden 263.
Diamond, gem and industrial value, thousands	$723	$1,088	Belgium-Luxembourg $814; West Germany $225.
Diatomite and other infusorial earth	1,609	1,739	All from Iceland.
Feldspar and fluorspar	9,998	10,779	Yugoslavia 6,845; Norway 1,940; Spain 1,750.
Fertilizer materials: [4]			
Crude, phosphatic __thousand tons	522	603	U.S.S.R. 453; Algeria 103.
Manufactured:			
Nitrogenous __do	459	415	U.S.S.R. 170; Czechoslovakia 150; Austria 87.
Phosphatic __do	686	978	Yugoslavia 242; Austria 157; U.S.S.R. 141.
Potassic __do	856	991	U.S.S.R. 567; East Germany 386.
Mixed __do	161	329	Yugoslavia 152; Austria 106; West Germany 55.

See footnotes at end of table.

Table 3.—Hungary: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal sources, 1974
NONMETALS—Continued			
Fluorspar and cryolite [3]	1,000	928	All from U.S.S.R.
Graphite, natural	379	402	All from West Germany.
Gypsum, calcined [4]	47,251	52,741	Romania 27,971; East Germany 12,647; Poland 12,104.
Lime [4]	8,001	60,073	Austria 30,642; Romania 29,431.
Magnesite, calcined [4 5]	84,973	99,868	Czechoslovakia 71,675; U.S.S.R. 14,027.
Mica, crude and worked	14	62	Switzerland 35; United States 23.
Pigments, mineral, iron oxides and hydroxides	2,446	2,572	West Germany 1,993; France 465.
Precious and semiprecious stones, except diamond ____value, thousands	NA	$76	Switzerland $49.
Pyrite, gross weight [4] ____thousand tons	79	70	All from U.S.S.R.
Salt [3] ____do	373	82	Do.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	3,565	5,821	Yugoslavia 2,906; Greece 1,018; Italy 795.
Worked	131	30,642	All from Austria.
Gravel and crushed rock	--	1,205	All from West Germany.
Quartz and quartzite	215	1,313	West Germany 1,116; Netherlands 197.
Sand, industrial [4]	83,088	81,630	Czechoslovakia 63,561.
Sodium and potassium compounds:			
Caustic soda [4]	142,669	118,998	West Germany 50,865; Italy 19,734; Romania 13,327.
Soda ash [6]	r 52,074	17,211	All from Bulgaria.
Caustic potash [4]	127,866	2,959	U.S.S.R. 2,048; East Germany 610.
Sulfur: [4]			
Elemental ____thousand tons	183	182	Poland 84; U.S.S.R. 77.
Sulfuric acid	--	19,272	All from Poland.
Talc and natural steatite	1,571	2,924	Mainly from Austria.
Other nonmetals, n.e.s.:			
Crude other than meerschaum	1,085	1,361	All from West Germany.
Oxides and hydroxides of magnesium, strontium, barium	NA	236	France 119; West Germany 117.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [4]	13,335	13,818	U.S.S.R. 10,662; Romania 1,687.
Coal, anthracite and bituminous [4 5] thousand tons	1,470	1,430	Czechoslovakia 570; Poland 540; U.S.S.R. 319.
Coal briquets [4]	416	518	All from East Germany.
Coke, all types [3 4 5]	1,207	1,200	U.S.S.R. 644; Czechoslovakia 284; Poland 257.
Gas, natural [4]	r 7,063	7,063	All from Romania.
Hydrogen, helium and rare gases	19	2	All from West Germany.
Petroleum:			
Crude [4] __thousand 42-gallon barrels	48	50	Mainly from U.S.S.R.
Refinery products:			
Gasoline [4] ____do	1,228	1,123	Do.
Kerosine [4] ____do	871	974	Do.
Distillate fuel oil [4] ____do	4,055	4,561	Do.
Residual fuel oil [4] ____do	803	880	Do.
Lubricants [4] ____do	81	170	U.S.S.R. 76; Romania 44.
Other:			
Mineral jelly and wax__do	(7)	1	All from West Germany.
Nonlubricating oils, n.e.s. do	12	15	Austria 6; Netherlands 5; West Germany 3.
Bitumen and other residues do	--	343	Mainly from Albania.
Bituminous mixtures, n.e.s. do	1	--	
Liquefied petroleum gas [4] do	--	478	Mainly from U.S.S.R.
Petroleum coke ____do	--	4	All from West Germany.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals [3]	r 23,121	9,090	U.S.S.R. 5,392; United Kingdom 1,338.

r Revised. NA Not available.

[1] Compiled from 1973 edition of the World Trade Annual, v. 1–3, Walker and Company, New York, 1975, unless otherwise noted.

[2] Compiled from the 1974 edition of the Supplement to the World Trade Annual, v. 1 (Eastern Europe), Walker and Company, New York 1976 (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.

[3] Source: Official trade statistics of U.S.S.R.

[4] Source: Official trade statistics of Hungary.

[5] Source: Official trade statistics of Czechoslovakia.

[6] Source: Official trade statistics of Bulgaria.

[7] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—Hungary's primary aluminum production increased slowly to 70,221 tons in 1975, a 1.7% increase over that of 1974. Hungary's three reduction plants—Ajka, Inota, and Tatabánya—had a total capacity of about 90,000 tons per year. The production of alumina in 1975 reached 756,000 tons. The three alumina plants—Ajka, Almásfüzitö, and Mosonmagyaróvár—together showed a 9.4% increase over the 1974 output. Bauxite production in 1975 was 2,889,000 tons, 5.0% over that of 1974. Hungary's aluminum industry production and trade is summarized in table 4.

The production of aluminum from alumina in Hungary slowed down mainly because of the lack of available electric power. The marginal expansion was made possible by an exchange agreement between Hungary (which would provide alumina) and Czechoslovakia (to provide electric power). The rest of the alumina is processed primarily under agreements with the U.S.S.R. and Poland. Under the terms of a Hungarian-Soviet cooperative agreement in effect since 1962, Hungary had been exporting increasing amounts of alumina each year to the U.S.S.R.[5] In 1975, 403,000 tons of alumina was exported and 117,000 tons of aluminum was imported from the U.S.S.R.

The Hungarian-Polish agreement calls for an export of 80,000 tons of alumina between 1976 and 1978 in exchange for the import of 17,500 tons of aluminum. In 1975, Hungary shipped a total of 136,000 tons of alumina to Poland. Other Hungarian alumina exports during 1975 included 87,000 tons to Austria, 23,000 tons to East Germany, 16,000 tons to Romania, 10,000 tons to West Germany, and 9,000 tons to Czechoslovakia.[6]

In the Hungarian aluminum industry, two companies were involved in bauxite mining. The Bakony Region Bauxite Co. mined approximately two-thirds of the country's production, while the Fejér County Bauxite Mines produced the remainder. Drilling for exploration of bauxite and for ground water control was performed by the Bauxite Prospecting Enterprise. The Bakony bauxite mines are located about 15 miles northwest of Lake Balaton north of the town of Tapolca, and mine the Iszkaszentgyörgy, Halimba, Nyirád, Szöc, and Sümeg deposits. The Fejér County mining area near Tatabánya includes the deposits at Gant near the western end of the Vertes Mountains and 30 to 40 miles west of Budapest. Bauxite also occurs in the Barzsony District (the Nezsa deposits about 25 miles north of Budapest), and in the Harsány District in southern Hungary near the Yugoslav border.[7] The Halimba No. 3 bauxite mine is one of Europe's largest and is located north of Lake Balaton, with an annual productive capacity of 600,000 tons of bauxite.

The chemical composition of Hungarian bauxite varies considerably. Most deposits contain 50% to 69% Al_2O_3 and some even

[5] Hungarian Foreign Trade (Budapest). No. 2, 1976, pp. 23–25.
[6] Külkereskedelmi Statisztikai Evkönyv, 1975 (Foreign Trade Statistical Yearbook, 1975) (Budapest). 1976, p. 184.
[7] Mining Magazine (London). Hungarian Bauxite Mining in the Bakony Region. V. 132, No. 5, May 1975, pp. 350–359.

Table 4.—Production and trade of the aluminum industry

(Thousand metric tons)

	1970	1975	1980 (planned)
Bauxite production	2,022	2,889	3,000–3,100
Bauxite export	660	603	NA
Alumina production	441	756	800
Alumina export	412	686	NA
Primary aluminum production	66	70	72–73
Aluminum import	82	147	NA
Aluminum export	53	61	NA
Semifinished aluminum products production	82	144	167

NA Not available.

Source: Statisztikai Evkönyv 1975 (Statistical Yearbook 1975), Budapest, 1976.

reach 76.8%, while others are very low in grade.[8] In most deposits, the contained SiO_2 amounts to 1% to 5% and recently was reported in some cases 7% to 8%.[9] The Fe_2O_3 content of various deposits may vary from zero to 50%.

Estimates of Hungarian bauxite reserves in 1975 were about 150 million tons. The static or declining quality and increasing difficulties in mining bauxite precludes further expansion of mining operations. Individual bauxite deposits are becoming smaller, are at greater depths, and are below ground water levels.

Bauxite is the only nonferrous metal ore that is exported in significant quantities by Hungary. In 1975, Hungary exported a total of 603,000 tons of bauxite. Of this total, 313,000 tons went to Czechoslovakia, 110,000 tons to Poland, and 180,000 tons to East Germany.

In the fifth (1976–80) 5-year plan, a 7% increase in bauxite output is planned to raise the bauxite production to 3.1 million tons in 1980. The Nyirád and six other major mines will be opened or re-equipped by 1980, and the development of the bauxite mines in the Bakony Hills will begin in 1978.[10] The 300,000-ton-per-year bauxite mine at Izamajor is scheduled to be completed by yearend 1976. The second stage of the Rákhegy bauxite mine was opened in 1975 and was to have an annual capacity of 125,000 tons. An investment of Ft 600 million was required to open the mine.[11]

The production of semifinished aluminum products, including rolled, pressed, and forged products; bars; wire; foil; etc., reached 144,500 tons in 1975 and is to reach 167,000 tons in 1980. The most important manufacturer of semifinished aluminum goods is the Székesfehérvár Light-Metal Works, which was being expanded during 1975 and should reach an annual production of approximately 72,000 tons of hot- and cold-rolled strip, wire, sheets, foil, and other semifinished products in 1976.

To expand its aluminum industry, Hungary plans to spend Ft 9.2 billion between 1975 and 1980. An investment of Ft 4.2 billion will be applied to bauxite excavation, alumina production, and aluminum processing. The rest of the investment will be used to expand and modernize existing production facilities for finished and semifinished aluminum products.

In the fifth 5-year plan (1976–80), the capacity of the rolling mill at the Székesfehérvár Light-Metal Works is to be increased from 60,000 to 120,000 tons per year. Its rolling mill is to produce 40,000 to 50,000 tons per year compared with the 25,000 tons produced in 1974. A continuous-casting rolling mill and wire-drawing units are also planned to be put into operation during this period.[12]

Hungary has been active in exporting engineering and design technology for the construction of alumina plants. Recently Hungary helped develop alumina plants in Korba, India; Obrovac and Zvornik, Yugoslavia; Tulcea, Romania; and in Greece and the Malagassy Republic.[13]

Copper.—According to Hungarian sources, refined copper production was 13,010 tons in 1975. In 1975, Hungary imported 44,528 tons of copper, of which 33,121 tons came from the U.S.S.R.

During 1975, exploratory work continued at the newly discovered copper deposits at Recsk in the Mátra Mountains. Hungary considers the find to be a deposit of world significance and was developing its biggest mine there.[14] The ore is found at great depths but is thought to contain enough economically minable reserves to supply the country's domestic requirements in the future. The deposit also contains lead and zinc.[15] The main shaft of the new mine, which was being developed, was 1,270 meters deep. Workings to the deposits have been developed at depths of 700, 900, and 1,100 meters. The second shaft of this mine was being constructed during 1975. Soviet machinery was being used to develop the mines and over 1,000 miners were employed at this site.[16]

Gallium.—Hungary's gallium is found in bauxite, combined with aluminum. The Ajka alumina and aluminum plant, located

[8] Page 351 of work cited in footnote 7.
[9] Zámbó, J. (Problems in the Aluminum Industry). Magyar Tudomány (Budapest), No. 2, February 1973.
[10] Hungarian Review (Budapest). No. 10, 1976, p. 12.
[11] Bányászati és Kohászati Lapok—Kohászat (Mining and Metallurgy—Metallurgy) (Budapest). No. 8, August 1975, p. 382.
[12] Kohászat (Budapest). No. 9, September 1975, pp. 415–421.
[13] Magyar Hírlap (Budapest). April 22, 1976, p. 7.
[14] Népszabadság (Budapest). Nov. 30, 1975, p. 5.
[15] Bányászat (Budapest). V. 109, No. 4, 1976, pp. 245–248.
[16] Népszava (Budapest). Oct. 12, 1975, p. 3.

in West Hungary, was planning to double its gallium production, according to future plans.

Iron Ore.—Iron ore production in 1975 was 642,300 tons, with an iron content of 152,900 tons. Only about 10% of Hungary's requirements for iron ore was met by domestic production at the Rudabánya deposit, and there was little possibility of finding other deposits. In the course of the 1976–80 5-year plan, Rudabánya is to produce 4.3 million to 4.5 million tons of iron ore. In 1975, Hungary imported a total of 4.3 million tons of iron ore, of which 4.0 million tons came from the U.S.S.R. and 208,000 tons came from India.

Iron and Steel.—In 1975, the production of crude steel reached about 3.7 million tons, a 5.9% increase over that of 1974. Over 90% of Hungary's crude steel production came from three large metallurgical complexes: 1.2 million tons from the Ozd Metallurgical Works; 1.2 million tons from the Danube Iron Works; and 993,000 tons from the Lenin Metallurgical Works.[17] The 1975 import of crude steel totaled 19,401 tons, mainly from Yugoslavia.

The total pig iron production in 1975 was 2.2 million tons, 2.1 million tons of which was used for steel production. In 1975, Hungary imported a total of 253,000 tons of pig iron, 238,000 tons of which came from the U.S.S.R.

Steel produced by the open hearth method was 3.3 million tons, while 338,000 tons was produced by electric arc smelting. In 1975, 32% of the total steel production was produced with oxygen injection.[18] By 1980, total Hungarian crude steel production is to reach 4.3 million to 4.5 million tons per year. The output of the Ozd Metallurgical Works is to be increased to 1.4 million tons per year, while that of the Danube Iron Works is to be between 2.2 million and 2.4 million tons per year. The obsolete Siemens-Martin open hearth furnaces at the Lenin Metallurgical Works are to be dismantled and replaced by oxygen-converter steel production of approximately the same capacity.

At the Danube Iron Works, construction is scheduled to begin in mid-1976 on two 130-ton oxygen converters. The annual capacity of these converters is to be approximately 1 million tons.[19]

To increase the steel production at the Ozd Metallurgical Works, a new 110-ton open hearth furnace was built, increasing the total number of furnaces to nine. During 1975, a rod and wire rolling mill began operations at this complex. The mill was manufactured by West Germany's Siemag and had a capacity of 350,000 tons per year. It was to roll 12.5- to 40-millimeter-diameter bars and 5.5- to 12.5-millimeter-diameter wire rods.

At the Lenin Metallurgical Works, a high-alloy-steel rolling mill began operation on an industrial scale in 1975. A new steel plant, also to be built there, will consist of an 80-ton electric furnace, an 80-ton oxygen converter, an oxygen factory to supply the oxygen for steel manufacture, and a material-transport system.

Output of steel rolled products reached 2.7 million tons in 1975, an increase of 11.8% over that of 1974. By 1980, production of rolled steel is to reach 3.1 million to 3.3 million tons per year. In 1975, 955,000 tons of rolled steel semimanufactures was imported by Hungary, 688,000 tons of which came from the U.S.S.R. During the same period, 873,000 tons was exported.

Lead and Zinc.—Lead and zinc ore production in 1975 was 146,650 tons, a 10% decrease compared with that of 1974. In 1975, the production of primary and secondary lead was 716 tons and 13,000 tons, respectively. The production of primary zinc was estimated at 2,200 tons, while secondary zinc production was 680 tons. Hungary imported 212,392 tons of lead and 26,513 tons of zinc in 1975.

Manganese Ore.—In 1975, the manganese ore production was 130,800 tons, an increase of 14.7% over that of 1974, but just below the production of 1973. The average composition was reported as 21.6% manganese and 9.2% iron. Manganese mines in Hungary are located at Urkút and Csárdahegy, near the Halimba bauxite mines north of Lake Balaton.

In 1975, Hungary imported 14,914 tons of manganese ore from the U.S.S.R. and exported 18,075 tons to West Germany and 7,741 tons to Czechoslovakia. Hungary also imported a total of 40,349 tons of 75% to 80% ferromanganese in 1975, of which 22,451 tons came from the U.S.S.R., 10,720

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[17] Népszabadság (Budapest). Jan. 10, 1976, p. 5.

[18] Energiagazdálkodás (Budapest). V. 17, No. 4, April 1976, pp. 152–156.

[19] Work cited in footnote 18.

tons came from Japan, and 4,099 tons came from Norway.

NONMETALS

Cement.—The country's total cement production in 1975 reached 3.8 million tons, a 9.4% increase over that of 1974. In 1975, Hungary imported a total of 981,000 tons of cement, of which 754,000 tons came from the U.S.S.R., 132,000 tons from East Germany, 70,000 tons from Romania, and 11,000 tons from Bulgaria. Hungarian exports of cement in 1975 totaled 65,000 tons, most of which went to Yugoslavia and Czechoslovakia.

The Hejöcsaba cement plant, located near Miskolc, became operational during 1975. It is to produce 1.6 million tons per year of portland cement, but will not reach its full capacity until 1978. This plant was built with an investment of $230 million, West German technology, and Czechoslovakian equipment. The two major operational plants are the Danube Cement Works, located at Vác, north of Budapest, and the Beremend plant, located on Hungary's southern border. Both of these plants had annual capacities of 1 million tons each.

Hungary is constructing its fourth major cement plant at Bélapátfalva near its northern border. The plant is to have an annual capacity of 1.2 million tons and is to be onstream in 1978.

Fertilizer Materials.—Hungary produced a gross weight of over 3.1 million tons of mineral fertilizers in 1975. The nitrogen fertilizer produced was 421,000 tons (nitrogen content), while phosphatic fertilizer was 206,000 tons, (P_2O_5), showing 7.1% and 8.4% increases, respectively, over the 1974 figures. Hungary does not have any phosphate or potash raw materials and thus must import these commodities. Production of nitrogen fertilizers, however, is based largely on domestic resources of natural gas from the fields of Szeged and Hadjúszoboszló.

Trade of fertilizer materials showed no significant change in 1975, and substantial quantities were imported to satisfy domestic demand. Imports of nitrogen fertilizers totaled 411,000 tons (at 20.5% nitrogen content), of which 186,000 tons came from the U.S.S.R., 124,000 tons from Czechoslovakia, and 54,000 tons from Austria. Potassium fertilizer imports amounted to 1.4 million tons (at 40% K_2O), of which 837,000 tons came from the U.S.S.R. and 465,000 tons from East Germany. Total phosphatic fertilizer imports were 678,000 tons (at 18% P_2O_5), of which 202,000 tons came from the United States, 142,000 tons from the U.S.S.R., 131,000 tons from Yugoslavia, and 103,000 tons from Austria. Hungary also imported a total of over 702,000 tons of raw phosphate materials, of which 618,000 tons came from the U.S.S.R. as apatite concentrate.

The Pétfürdö Fertilizer Complex was commissioned at the end of 1975 at Pétfürdö (previously called Várpolota), which is located southwest of Budapest. When fully operational, it is to consist of a 330,000-ton-per-year ammonia plant, a 200,000-ton-per-year urea plant, a 430,000-ton-per-year nitric acid plant, a 236,000-ton-per-year ammonium nitrate plant, and a 746,000-ton-per-year complex fertilizer plant.[20] Full-capacity production was slated for 1978 and was to turn Hungary into an exporter of nitrogen fertilizers. A number of large chemical engineering firms from various countries were involved in the design and construction of the complex. The U.S.S.R. supplied technology and equipment for the nitric acid plant, the United Kingdom's M.W. Kellogg provided the ammonia plant, Coppée-Rust of Belgium delivered the urea plant, and the French firm Gexa provided the complex fertilizer plant. A number of Hungarian enterprises also took part in the project.

This fertilizer complex was one of the largest investments of the 1971–75 5-year plan, with a cost of approximately Ft 10 billion. According to plans, it was to produce over 600,000 tons of complex fertilizers in 1976 in addition to the 220,000 tons of nitrogen fertilizers and 200,000 tons of urea. However, major setbacks and delays were encountered owing to various problems of equipment startup and malfunction.[21] According to Hungarian sources, only one of the four boilers in the nitrogen acid plant was functioning adequately, and delivery of the replacement boilers was long overdue. The rupture of an acid-resistant pipe caused the loss of Ft 150 million worth of

[20] Nitrogen (London). No. 98, November–December 1975, pp. 30–32.
[21] Magyar Hírlap (Budapest). Sept. 18, 1975, p. 7.

gas that would have been transformed to ammonia. In the complex fertilizer plant, the French equipment could scarcely bear the stress imposed by corrosion and erosion and proved to be unreliable. To make matters worse, the French Gexa Co., which provided this equipment, became bankrupt.[22] The situation was further aggravated by the fact that the complex fertilizer plant could not receive enough raw ammonia or ammonia processed into nitric acid to keep production flowing. The whole complex was also short of manpower. The labor force was only 700, while plans called for 1,200 employees.[23]

Other Hungarian nitrogen fertilizer complexes are the Borsod Chemical Combine (BVK) at Karzincbarcika near Miskolc, the Tisza-Region Chemical Industry Combine (TVK), and the Tisza-Region Chemical Works (TVM), all of which are located in the Tisza valley.

Hungary has signed a recent trade agreement with RTB Copper of Yugoslavia to obtain extra supplies of phosphates in the future. Beginning in 1978, Yugoslavia will provide 100,000 tons per year of ammonium phosphates and 100,000 tons per year of tripolyphosphates in return for 70,000 tons per year of ammonia and other nitrogen fertilizers. The phosphates are to be imported from the Prahavo works, which were developed with Hungarian financial help.[24]

Sulfur and Sulfuric Acid.—The production of byproduct sulfur in 1975 was 8,937 tons, 4.8% less than the output in 1974. In 1975, Hungary imported a total of 208,567 tons of sulfur, of which 129,941 tons came from Poland and 78,488 tons came from the U.S.S.R. Sulfuric acid production in 1975 was 630,000 tons, while imports were 23,389 tons from Poland and 2,554 tons from the U.S.S.R. The country's sulfuric acid was produced mostly from imported sulfur.

MINERAL FUELS

Hungary's primary energy consumption for 1975 reached an estimated 40.8 million tons of standard coal equivalent, representing a 6.2% increase over that of 1974. Coal provided 39.0% of the total primary energy consumed, while oil represented 38.7%; natural gas, 19.6%; hydroelectric and imported energy, 1.7%; and fuelwood, 1.0%. In 1975, Hungary produced 59.6% of its primary energy consumption from its domestic fossil fuels, while it imported 42.6% and exported 2.2%. In general, the total primary energy distribution for 1974 and 1975 did not change except for an increase of oil and natural gas imports in 1975. The total primary energy balance for Hungary for 1974 and 1975 is shown in table 5.

In 1975, Hungary produced a total of 20.5 billion kilowatt-hours of electric energy, showing an increase of 8% over that of 1974. The total electric generating capacity in 1975 was increased by 750 megawatts. Thermal powerplants generated 99.5% of Hungary's electric power, while

[22] Work cited in footnote 21.
[23] Népszabadság (Budapest). Apr. 27, 1976, p. 5.
[24] Page 32 of work cited in footnote 20.

Table 5.—Hungary: Total primary energy balance for 1974 and 1975

(Million tons standard coal equivalent) [1]

	Total primary energy	Coal (lignite, brown, bituminous, and coke)	Crude oil and petroleum products	Natural and associated gas	Fuelwood	Hydroelectric and other power
1974:						
Production	24.6	14.5	2.9	6.8	0.4	--
Imports	14.6	2.0	11.5	.3	--	0.8
Exports	.8	.1	.5	--	--	.2
Apparent consumption	38.4	16.4	13.9	7.1	.4	.6
1975:						
Production	24.3	14.0	3.0	6.9	.4	--
Imports	17.4	2.0	13.4	1.1	--	.9
Exports	.9	.1	.6	--	--	.2
Apparent consumption	40.8	15.9	15.8	8.0	.4	.7

[1] 1 ton standard coal equivalent (SCE) = 7,000,000 kilocalories. 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 power, 0.125 (per 1,000 kilowatt-hours).

Source: World Energy Supplies, Statistical Papers, Series J, No. 18 (United Nations), New York, 1975.

hydroelectric powerplants were responsible for 0.5%. Nuclear power was still in the developmental stage. Construction continued on the Paks nuclear powerplant, which was scheduled to begin operation in 1980 with its first 440-megawatt block. By yearend 1984, this plant is to have a capacity of 1,760 megawatts, and by 1990, Hungary's nuclear energy capacity is to reach 4,000 megawatts.

According to official reports in 1975, Hungary's reserves of energy sources were 22% bituminous coal, 41% brown coal, 23% lignite, 11% natural gas, and 3% petroleum.[25] To develop fuel for future energy requirements, Hungary will be concentrating on modernizing and expanding underground coal mining and searching for new deposits. More emphasis will also be placed on geological and coal mining research. By 1980, Hungary is to import 56% to 58% of its energy needs, of which the U.S.S.R. is to provide 47%. Hydrocarbons are to provide a higher proportion of energy, from 58% in 1975 to 64% to 66% in 1980.

Coal.—The total production of coal from Hungary's 46 underground coal mines and one open pit in 1975 approached 25 million tons, which satisfied internal demand for these commodities and supplied about 26% of the country's energy requirements. Coal production showed a 3.4% decrease compared with 1974 production, owing mainly to the closing of small submarginal mines. In striving to increase mechanization and improve productivity, Hungary was terminating uneconomical production facilities. Bituminous coal production in 1975 was 3.0 million tons, while brown coal and lignite production were 15.0 million and 7.0 million tons, respectively. During the 1976–80 5-year plan, total coal production is expected to be maintained at about 25 million tons per year.

In 1975, Hungary imported a total of 1.4 million tons of bituminous coal and anthracite. Czechoslovakia provided 569,000 tons of this coal, while Poland and the U.S.S.R. supplied 483,000 tons and 385,000 tons, respectively. A total of 554,000 tons of brown coal briquets was imported from East Germany in 1975. Hungary exported 96,000 tons of brown coal, 30,000 tons of coal briquets, and 7,000 tons of industrial and domestic coke in 1975.

About Ft 2.3 billion was invested in 1975 in development of coal mining. Ft 1.0 billion was used for obtaining machinery and for technical development, Ft 0.7 billion was used for coal inventory expansion and reconstruction, and Ft 0.5 billion was used for mining safety improvements.[26]

Hungary was planning to increase mechanization in underground coal mines to over 60% and the production from complex mechanized faces to above 40%. By 1980, 30% to 35% of the drifts are to be driven by modern machines. The production of coal at Mecsek, as well as the capacity of the coke works at Dunaujváros, is to be increased so that by 1981–82 the production of bituminous coal is to reach 3 million tons per year.

The construction of the Thorez open pit mine was finished at yearend 1975. The total of 5.4 million tons of lignite produced from this mine in 1975 was used to supply thermal powerplants. Overburden removed in 1975 reached 34 million tons.[27]

Four new underground mines are to be opened in the next 15 years in order to keep in step with the electrical power requirements. These mines, to be located in the Komárom Basin, are the Márkushegy mine at Oroszlány, the Lencsehegy mine at Dorog, and the Nagyegyháza and Mány mines in the Tatabánya area. In addition, the open pit at Bükkabrány, 150 kilometers northeast of Budapest, is expected to begin mining lignite in 1980 with a planned production capacity of twice that of the Thorez open pit. With the help of these mines, coal production in 1990 is to increase 40% to 45% to about 36 million to 37 million tons.[28] The U.S.S.R. and Poland will provide 50% and 20% of the required equipment, respectively. The rest of the equipment will probably be provided by market economy countries.

Hungary will spend Ft 1.2 billion during the 1976–80 5-year plan in exploration for new coal deposits. A deposit in the Mazaszaszvar area was expected to confirm significant coal reserves as a result of deep-drilling exploration, and a large-capacity underground mine may be developed there as a result. A new mine was to be opened in

[25] Magyar Hírlap (Budapest). June 1, 1976, p. 7.
[26] Figyelö (Budapest). No. 2, Jan. 14, 1976, pp. 1–5.
[27] Work cited in footnote 26.
[28] Work cited in footnote 26.

1976 at the coal deposit in Nagyegyháza, which borders on Tatabánya. Extensive geological research was underway in the Sajomercse and in the Ozd Basin, where approximately 90 million tons of good-quality coal was found through exploratory drillings completed in the fall of 1975. Intensive research was initiated in Menkes at the Nógrád mines to explore a coal deposit estimated at close to 10 million tons. Further geological research was carried out in the area of the Oroszlány 20 mine at Majk and the Trancsics mine at Ajka, in western Transdanubia in the vicinity of Torony, and in the Boda Valley on the border of the Kompáti township.[29] Large quantities of lignite were also discovered between Bükkábrány and Emöd.

Plans have been drawn up for Hungary's largest coking plant, which is to be built at the Danube works at Dunaujváros. Construction was to start in 1976 and last 3 to 4 years. The plant is to have a capacity of 640,000 tons per year of blast furnace coke.

Natural Gas.—The natural gas production for 1975 was 5.2 billion cubic meters (183 billion cubic feet), a 1.6% increase over that of 1974. Hungary also produced 637 million cubic meters (22.5 billion cubic feet) of manufactured gas from coal or hydrocarbons in gas plants in Budapest, Szombathely, Györ, Pécs, Baja, Sopron, and Dunaujváros. Imports of natural gas in 1975 amounted to 806 million cubic meters, of which 600 million came from the U.S.S.R. 200 million from Romania, and 5 million from Czechoslovakia. According to a long-term contract, Romania is to provide Hungary with an annual 200 million cubic meters of natural gas from Romanian gasfields. In the 1976–80 5-year plan, Hungary is to receive 10 billion cubic meters of gas from the U.S.S.R. through the Brotherhood pipeline, and 1 billion cubic meters from Romania.

The Brotherhood natural gas pipeline from the U.S.S.R. to Hungary was completed in 1975. The first section of the 230-kilometer line, which lies between the Soviet border and Leninváros, was completed in the spring of 1975. The second section, which was finished at yearend with the help of the U.S.S.R., runs between Leninváros and Zsámbok.[30]

Hungary was participating in the construction of the Orenburg gas pipeline together with the other COMECON countries. This 2,750-kilometer pipeline is to link the large natural gas deposit in Orenburg, located in the southern Ural Mountains of the U.S.S.R., with the borders of Eastern Europe. By 1980, this pipeline is to provide an annual 15.5 billion cubic meters of Soviet natural gas to the participating countries. Hungary, which is to receive 2.8 billion cubic meters per year, is responsible for a 500-kilometer length of the pipeline running from Orenburg to Aleksandrova Gai and three compressor stations at Chust, Bogorodsani, and Gusyatin.

Petroleum.—In 1975, Hungary's oil wells produced 2.0 million tons of crude oil, providing about 20% of the nation's consumption. Domestic production was expected to remain at this level during the 1976–80 5-year period, since discovery of new deposits was not deemed likely. Hungary imported a total of 8.4 million tons of crude oil in 1975, an increase of 24% over that of 1974. The U.S.S.R. provided 7.0 million tons of crude oil; Iraq provided 1.2 million tons; Algeria, 203,000 tons; Iran, 61,000 tons; and Albania, 5,000 tons.

Hungarian imports of Soviet crude oil were received through the Friendship I and II pipelines. The Friendship I pipeline runs from Sahy in Czechoslovakia to Százhalombatta in Hungary and has a capacity of about 4.5 million tons per year. The Friendship II pipeline, which was commissioned in 1973, stretches from Uzhgorod in the U.S.S.R. to Százhalombatta via Leninváros in Hungary and has an annual capacity of 10 million tons. The oilfields of Transdanubia, the Szeged area, and the Százhalombatta refinery were interconnected by other pipelines. In 1975, Hungary refined 9.5 million tons of crude oil, most of which came from the Friendship pipelines.

Construction continued on the Adriatic pipeline extending from the island of Krk, off the coast of Yugoslavia, through Hungary to Bratislava, Czechoslovakia. The pipeline is to carry Middle Eastern and African crude oil to Hungary, Czechoslovakia, and Yugoslavia by yearend 1977. By 1980, a total of 34 million tons per year of crude oil is expected to flow through the pipeline; Hungary and Czechoslovakia are

[29] Work cited in footnote 25.
[30] Hétföi Hírek (Budapest). Jan. 19, 1976, p. 5.

to receive 5 million tons each. Both Hungary and Czechoslovakia are to contribute $25 million to Yugoslavia for construction of the pipeline over Yugoslav territory, while each country was to be responsible for the construction of the pipeline on its own territory. In Hungary, the pipeline is to extend to Százhalombatta.

During the year, an agreement was signed between the U.S.S.R. and Hungary on cooperation between the oil industries of the two countries. The U.S.S.R. was to increase its crude oil deliveries to Hungary at the rate of 200,000 tons per year. In return, Hungary was to supply the U.S.S.R. with industrial products to be used in expanding the Soviet oil output, including pumps, automatic control components, data transmission systems, an instrument factory, etc.[31]

A new Soviet-Hungarian pipeline for refined petroleum products has been planned for completion in 1978. The pipeline is to have a capacity of 1.0 million tons of automobile and diesel fuel. Hungary is to work on 120 kilometers of the pipeline, which is to join the domestic network at Leninváros and extend to Nyírbagdány where the U.S.S.R. is to construct 60 kilometers of the pipeline leading to the Soviet border.

Exploratory oil drilling was planned in the Györ-Sopron county in the vicinity of Mosonszolnok, Rajka, and the valley of the Dráva River. At Zola, depleted wells were being reworked by secondary methods in the hope of recovering 70% to 80% of the original amount of crude.[32]

Nuclear Power.—Work proceeded on the nuclear powerplant at Paks on the Danube River, 120 kilometers south of Budapest. The first of the four 440-megawatt Novovoronezh-type light-water reactor blocks was scheduled to begin operation in 1980. The second block was to start up in 1981, the third in 1983, and the fourth in 1984, reaching a planned total capacity of 1,760 megawatts. By 1990, total capacity of this powerplant is to reach 4,000 megawatts with the help of 1,000-megawatt Leningrad-type units. The design and construction of this powerplant was being carried out under a Soviet-Hungarian cooperation agreement. About 30% of the equipment is to be provided by Hungary, while the rest is to come from the U.S.S.R.[33]

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[31] Világgazdaság (Budapest). Feb. 5, 1976.
[32] Magyar Hírlap (Budapest). Feb. 15, 1976, p. 15.
[33] Pages 16–17 of work cited in footnote 5.

The Mineral Industry of Iceland

By Joseph B. Huvos [1]

In 1975 Iceland had no significant domestic mineral production. However, hydroelectric and geothermal energy helped the country to produce, from imported alumina, about 0.5% of the world's aluminum. Other minerals of lesser importance produced in Iceland included diatomite (about 1.5% of the world total) and modest amounts of hydraulic cement, fertilizer materials, sand, gravel, and stone.

In 1975, Iceland's gross national product (GNP) was about $1,134 million.[2] Of this, the aluminum industry contributed about $33 million; cement, $10 million; fertilizer materials, $8.6 million; and diatomite, $3.3 million.

PRODUCTION

The Icelandic mineral industry was strongly affected by the world recession in 1975; aluminum was among the hardest hit, while cement and fertilizer materials registered gains. Production of selected mineral commodities is detailed in table 1.

Table 1.—Iceland: Production of mineral commodities

Commodity and unit of measure	1973	1974	1975 p
Aluminum smelter production, primary ---------- metric tons --	72,000	69,600	61,800
Cement, hydraulic ---------------------- thousand metric tons --	134	101	159
Diatomite ---------------------------------- metric tons --	22,300	e 22,500	e 22,500
Fertilizer materials, manufactured:			
Nitrogenous, gross weight ---------------------- do ----	NA	4,476	9,680
Other -- do ----	30,000	35,270	25,184
Pumice -- do ----	19,000	[1] 6,930	[1] 3,540
Sand and gravel:			
Calcareous ---------------------- thousand cubic meters --	119	119	110
Other sand and gravel ----------- thousand metric tons --	5,800	561	e 500
Stone:			
Dimension ------------------------------------- do ----	86	NA	NA
Crushed and broken ----------------------------- do ----	432	486	33
Scoria -- do ----	10	94	92

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

TRADE

Iceland's mineral trade was mainly with the countries of Western Europe and the U.S.S.R. Mineral commodity exports consisted principally of aluminum metal, metallic scrap, and diatomite. Mineral commodity imports were mainly petroleum products, alumina, iron and steel semimanufactures, and salt. In 1975 all exports from Iceland were subject to government licensing aimed at controlling export channels but not at restricting exports. There was also a 12% import duty on all imports, to be lowered to 10% in 1976.

[1] Physical scientist, International Data and Analysis.

[2] U.S. Embassy, Reykjavik, Iceland. State Department Airgram A-44, July 30, 1976. Values in Icelandic kronas (Ikr) were converted to U.S. dollars at the rate of Ikr153.70=US$1.00 for 1975.

Icelandic Government policy was aimed at controlling inflation by restraining labor from excessive wage demands, by reducing deficit financing, and by restraints on imports (or encouraging exports) to reduce the trade deficit, which was about 12% of the GNP in 1974.[3]

[3] U.S. Embassy, Reykjavik, Iceland. State Department Airgram A-2, Jan. 16, 1976.

Table 2.—Iceland: Mineral commodity trade
(Metric tons unless otherwise specified)

Commodity	1973	1974
EXPORTS		
METALS		
Aluminum metal including alloys, unwrought	79,843	63,071
Iron and steel scrap	3,345	5,276
Nonferrous metal scrap and metal bearing residues	754	490
NONMETALS		
Diatomite	22,269	24,055
Pumice stone	17,608	6,930
IMPORTS		
METALS		
Aluminum:		
Alumina	138,751	195,209
Metal including alloys:		
Unwrought	32	65
Semimanufactures	962	1,410
Chromium:		
Oxide and hydroxide	2	5
Copper:		
Metal including alloys, unwrought and semimanufactures	r 137	118
Iron and steel:		
Metal:		
Scrap	104	497
Pig iron, ferroalloys, and similar materials	223	98
Steel, primary forms	1	540
Semimanufactures:		
Bars, rods, angles, shapes, sections	19,015	23,185
Universals, plates, sheets	12,707	13,938
Hoop and strip	600	632
Rails and accessories	123	4
Wire	258	336
Tubes, pipes, fittings	6,576	7,210
Total	39,279	45,305
Lead:		
Oxides	13	18
Metal including alloys:		
Unwrought	82	60
Semimanufactures	29	3
Mercury ... 76-pound flasks	6	6
Nickel metal including alloys, all forms	2	1
Platinum-group metals and silver:		
Metals including alloys:		
Platinum group ... value, thousands	$29	$80
Silver ... thousand troy ounces	74	74
Thorium and uranium oxides ... kilograms	700	--
Tin, unwrought and semimanufactures	12	10
Titanium oxides	618	529
Tungsten metal including alloys, all forms ... value	r $710	$670
Zinc:		
Oxide	11	14
Metal including alloys:		
Blue powder	2	2
Unwrought	36	42
Semimanufactures	66	48
Other:		
Oxides, hydroxides and peroxides of metals, n.e.s	4	4
Metals including alloys, all forms:		
Metalloids	37	20
Base metal including alloys, all forms, n.e.s	(1)	(1)
NONMETALS		
Abrasives, natural, n.e.s	23	27
Asbestos	7	8
Barite and witherite	20	26

See footnotes at end of table.

Table 2.—Iceland: Mineral commodity trade—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974
IMPORTS—Continued		
NONMETALS—Continued		
Boron materials	11	3
Cement, hydraulic	25,076	32,098
Chalk	187	261
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	242	281
Products:		
Refractory (including nonclay bricks)	462	685
Nonrefractory	1,112	1,117
Cryolite and chiolite	200	535
Diamond, all grades ... value	$821	$300
Diatomite and other infusorial earth	--	(1)
Fertilizer materials:		
Crude	--	8
Manufactured:		
Nitrogenous	1,973	102
Phosphatic	1,949	1,093
Potassic	7,603	7,395
Other including mixed	23,172	24,234
Ammonia	1,006	2,672
Gypsum and plasters	7,718	8,691
Lime	1,192	1,316
Mica, all forms	11	9
Pigments, mineral, including processed iron oxides	34	43
Precious and semiprecious stones except diamond ... value, thousands	$14	$13
Salt and brine	35,792	67,051
Sodium and potassium compounds, n.e.s	431	356
Stone, sand and gravel:		
Dimension stone	93	117
Worked	7	35
Dolomite, chiefly refractory grade	728	2,146
Gravel and crushed rock	108	106
Limestone	1,449	444
Quartz and quartzite	30	106
Sand, excluding metal bearing	99	51
Sulfur, all forms	2 454	415
Talc, steatite, soapstone, pyrophyllite	64	82
Other nonmetals, n.e.s.:		
Crude	2	7
Oxides and hydroxides of magnesium, strontium, barium	2	3
Building materials of asphalt, asbestos, and fiber cement and unfired nonmetals, n.e.s	476	548
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	5,084	662
Carbon black and gas carbon	6	1
Coal, coke, peat	833	225
Hydrogen, helium, rare gases ... value	$422	$1,711
Petroleum refinery products:		
Gasoline, motor ... thousand 42-gallon barrels	699	626
Kerosine and white spirit ... do	872	547
Distillate fuel oil ... do	2,652	2,696
Residual fuel oil ... do	718	738
Lubricants ... do	47	54
Mineral jelly and wax ... do	3	2
Other:		
Liquefied petroleum gas ... do	8	9
Nonlubricating oil, n.e.s ... do	16	8
Pitch coke ... do	6	7
Bitumen and other residues ... do	61	46
Other, n.e.s ... do	2	2
Total ... do	5,084	4,735
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	299	579

r Revised.
1 Less than ½ unit.
2 Mainly sulfuric acid.

COMMODITY REVIEW

METALS

Aluminum.—Slack foreign demand caused a cutback in Iceland's aluminum production in 1975. The Icelandic Aluminum Co., a wholly-owned subsidiary of the Schweizerische Aluminium AG (ALUSUISSE), operated the 75,000-ton-per-year Hafnafjordur reduction plant south of Reykjavik. The plant was operated with inexpensive hydroelectric energy and used alumina imported from Australia as raw material.

Ferrosilicon.—Late in 1975 officials of Icelandic Alloys, a company jointly owned by Union Carbide Co. and the Icelandic Government, announced that scheduled construction of its ferrosilicon plant had been postponed indefinitely. Original plans had called for commissioning of the plant in 1977.

MINERAL FUELS

In 1975 hydroelectric and geothermal energy supplied over 40% of Iceland's energy needs. The remainder was imported in the form of petroleum products from Western Europe and the U.S.S.R. Installed capacity of Iceland's hydroelectric powerplants in 1975 was about 378 megawatts. Iceland's supply of energy and apparent consumption in 1974 and 1975 are shown in table 3.

Geothermal Energy.—In 1975, Iceland produced an estimated 315 thermal megawatts of geothermal energy, almost one-tenth of the world's total.[4] Iceland has 17 known high-temperature geothermal fields. Space heating ranked foremost in the country's utilization of geothermal energy, and about one-half of Iceland's population was served by geothermal energy for space heating. A 60-megawatt geothermal power station was under construction during 1975 and was to be commissioned in 1976 at the Krafla Field, 8 kilometers northeast of Namafjall in the northern part of the country.

[4] Geothermal Energy. V. 3, No. 11, November 1975, p. 11.

Table 3.—Iceland: Supply and apparent consumption of energy-producing materials for 1974 and 1975

(Million tons of standard coal equivalent)[1]

	Total energy	Coal and coke	Petroleum and refinery products	Hydro-electric power	Geothermal energy
1974:					
Production[2]	0.7	(3)	--	0.3	0.4
Imports	1.0	--	1.0	--	--
Exports	--	--	--	--	--
Apparent consumption	1.7	(3)	1.0	.3	.4
1975: p					
Production[2]	.7	(3)	--	.3	.4
Imports	.9	--	.9	--	--
Exports	--	--	--	--	--
Apparent consumption	1.6	(3)	.9	.3	.4

[1] 1 ton of standard coal equivalent (SEC) = 7,000,000 kilocalories.
[2] Includes only primary energy.
[3] Less than ½ unit.

Source: The Statistical Bureau of Iceland. Statistical Bulletin. V. 45, No. 1, February 1976. Geothermal Energy. V. 3, No. 11, November 1975, p. 11.

The Mineral Industry of India[1]

By Gordon L. Kinney [2]

The Indian economy recorded a generally good year in 1975; [3] there was an overall growth in the gross national product (GNP) of 6% in constant 1960 prices.[4] In current prices. India's GNP was $85.7 billion [5] in fiscal 1975. India's agricultural sector accounted for 45% of the GNP and hence continued to be the key factor affecting the economy. In 1975, overall economic gains were mainly the result of a particularly good monsoon season, which contributed to a record high production of 118 million tons of food grains.

India was in the midst of a serious industrial recession at the start of 1975. Poor monsoons for 3 years had affected agricultural production and hydroelectric generation. Labor problems were also reducing industrial production. Inflation of more than 20% per year for 1972-74 had hurt the overall economic situation. During the spring of 1975, the Government began to take firm measures to gain control of the economy. A partial freeze was placed on wages and dividends. Strong price controls were established on essential commodities, and tax concessions were made to industries and on personal income. A further attempt at stimulating economic recovery came with a proclamation of internal emergency in mid-year. The powers assumed by the Government under the emergency were heavily criticized but did stabilize the labor situation by ending strikes and lockouts. Production began to increase, and the end of the year looked favorable for an economic revival.

India's trade improved with a 19% increase in exports, which more than offset the 12% increase in total imports. The resulting balance-of-trade deficit stood at $1.25 billion, down from $1.37 billion in 1974.

That portion of the GNP attributed to mineral production was $1.18 billion, or about 1.4%.[6] Coal and lignite were the leading group with 56% of the total value, followed by petroleum and natural gas with 23%, metallic minerals with 13%, and nonmetallic minerals with 8%. Iron ore and limestone each contributed about one-half of the value of their respective groups.

As a matter of national policy, mineral exploration and development were being promoted. The fifth 5-year plan, ending in 1979, seeks to raise production of coal to 124 million tons (revised slightly downward from 135 million tons because of abundant pithead stocks), iron ore to 60 million tons, steel to nearly 10 million tons, cement to 25 million tons, and oil to 20 million tons. Development of several nonferrous-metal mines and smelters was planned as a result of exploration programs by the India Geological Survey. The overall objectives of the programs are to increase the utilization of domestically produced minerals and to increase the value of natural resources through concentration,

[1] The author would like to acknowledge the assistance of Francis E. Shafer, U.S. Regional Resources Attache, New Delhi, for his contribution of a series of specific mineral industry reports on India.

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[3] The Indian fiscal year runs from Apr. 1 through Mar. 31. Hereafter, 1975 will refer to the period Apr. 1, 1975 to Mar. 31, 1976 unless the calendar year is specifically mentioned.

[4] U.S. Embassy, New Delhi, India. Foreign Economic Trends and Their Implications for the U.S. Bull. 76-187, December 1976, p. 2.

[5] Where necessary, values have been converted from Indian rupees (Rs) to U.S. dollars at the rate of Rs8.50=US$1.00.

[6] India Bureau of Mines. Bulletin of Mineral Statistics and Information. V. 15, No. 6, November-December 1975, pp. 1-9.

smelting, and production of semimanufactures prior to export.

One of the most significant achievements of the year was the rapid development of the offshore oil discovery in the Bay of Cambay. Installation of the production platforms progressed unusually well because the Indian Government was anxious to begin at least partial production of crude oil as soon as possible. Imports of crude oil and products were the largest contributors to the balance-of-payments deficit in the mineral sector, and any additional domestic production will contribute to a lowering of these payments. Continued exploration in other offshore areas could yield more discoveries in the near future.

Despite the progress in oil, coal assumed an increasingly important role in India's energy picture. Coal consumption was encouraged over that of other fuels, and many powerplants and industries were converting from oil to coal where technologically feasible. There is little, if any, chance of oil being used as a source for earning foreign credits before the end of the current 5-year plan in 1979. On the other hand, coal is abundant, and production has been steadily increasing—to nearly 100 million tons in 1975. Coal stocks at the pitheads were high, and Government plans call for an aggressive program to increase coal exports from 440,000 tons in 1975 to at least 2.5 million tons in 1979. To continue development of the coal industry, the annual plan for 1976 called for an investment of $309 million. The emphasis was to be in the transport sector, modernization and mechanization of existing mines, and opening of more efficient high-output open pit mines.

Reserve tonnages for several of the important minerals have been changing rapidly as a result of an intensified exploration program. New reserve data are discussed in the individual commodity review sections of this chapter.

PRODUCTION

All of the major metallic minerals, except gold and silver showed healthy production gains during the year. Iron ore output was up 17%, and production of pig iron and steel ingots increased 14%, and 4%, respectively. The following increases were also recorded: Copper, 39%; chromite, 26%; zinc, 19%; bauxite, 14%; and manganese, 7%.

Among the nonmetallic minerals, apatite, barite, dolomite, emerald, agate and garnet, magnesite, and ochre all recorded increases for the year. Cement production increased 14% to over 16 million tons. Limestone remained steady at about 26 million tons.

In the fossil-fuel group, bituminous coal production was encouraged and showed a gain of 14% to 96 million tons. Crude oil increased 11%, and marketable natural gas output increased 39% to nearly 1 billion cubic meters.

Table 1.—India: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum:			
Bauxite, gross weight ____thousand tons__	1,292	1,113	1,270
Alumina, gross weight [e] ____do____	[r] 346	290	324
Metal, primary only	154,266	128,913	159,678
Antimony metal, regulus	[r] 497	393	238
Cadmium metal	33	59	53
Chromium, chromite, gross weight	290,537	396,535	499,248
Copper:			
Mine output, metal content	[r] 17,160	28,080	39,000
Metal:			
Smelter	[r] 11,000	10,950	24,020
Refined	12,011	11,773	24,000
Gold, smelter ____troy ounces__	[r] 106,097	101,114	90,825
Iron and steel:			
Iron ore and concentrate, gross weight ____thousand tons__	35,562	35,485	41,405
Pig iron ____do____	7,369	7,342	8,385

See footnotes at end of table.

Table 1.—India: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS—Continued			
Iron and steel—Continued			
Ferroalloys:			
Ferrochrome	6,633	15,300	10,128
Ferromanganese	141,063	146,015	142,398
Ferrosilicon	24,269	29,682	39,972
Other	2,164	1,644	3,538
Steel ingots thousand tons	6,882	6,820	7,082
Steel castings do	[r] 81	68	[e] 30
Semimanufactures:			
Angles, shapes, sections do	685	667	[2] [e] 850
Bars and rods do	1,982	1,699	[2] [e] 1,400
Plates and sheets:			
Uncoated do	587	635	[2] [e] 700
Galvanized do	155	160	[2] [e] 150
Tinplate do	84	27	[2] [e] 30
Hoop, strip, skelp do	472	474	[2] [e] 500
Rails and accessories do	365	356	[2] [e] 290
Wire do	286	53	--
Special steels, form not specified do	235	--	--
Total do	4,851	4,071	[2] [e] 3,920
Lead:			
Mine output, metal content	[r] 7,323	10,083	6,600
Metal, primary only	2,636	3,986	4,769
Manganese ore and concentrate, gross weight thousand tons	1,489	1,474	1,576
Rare-earth metals, monazite concentrate, gross weight [e]	[r] 3,858	[e] 3,300	[e] 3,300
Silver, mine and smelter output thousand troy ounces	137	150	83
Titanium:			
Ilmenite concentrate, gross weight	77,191	[e] 77,000	[e] 75,000
Rutile concentrate, gross weight	3,400	[e] 3,400	[e] 3,400
Tungsten, mine output, metal content	13	12	20
Zinc:			
Mine output, metal content	15,327	19,257	22,838
Metal	12,506	21,105	25,727
Zircon	[3] 11,311	[e] 11,400	[e] 11,400
NONMETALS			
Abrasives, natural, n.e.s.:			
Corundum, natural	[r] 248	335	311
Garnet	2,741	3,680	4,437
Asbestos	[r] 11,300	21,216	19,957
Barite	[r] 116,600	139,521	175,275
Cement, hydraulic thousand tons	15,000	14,265	16,234
Chalk	65,652	54,567	45,069
Clays:			
Ball clay	17,483	22,489	25,941
Diaspore	[r] 8,451	[r] 3,085	2,564
Fire clay	718,000	787,000	649,761
Kaolin:			
Directly salable crude	[r] 282,000	312,000	259,517
Processed	[r] 125,000	110,000	97,459
Total salable	[r] 407,000	422,000	356,976
Other	198,000	229,000	165,324
Diamond:			
Gem [e] thousand carats	18	18	17
Industrial [e] do	3	3	3
Total do	21	21	20
Diatomite	81	50	--
Feldspar	[r] 39,800	52,061	42,472
Fertilizer materials:			
Crude phosphatic:			
Apatite	9,980	11,971	30,338
Phosphate rock	136,512	433,545	429,049
Manufactured:			
Nitrogenous, nitrogen content [4] thousand tons	[r] 1,050	1,050	1,200
Phosphatic, P_2O_5 content [5] do	[r] 136	[e] 124	[e] 119
Fluorspar, all grades	[r] 3,384	3,893	3,067
Gem stones, excluding diamond:			
Agate (including chalcedony pebble)	1,104	1,030	1,588
Emerald, crude carats	3,365	2,165	38,280
Garnet kilograms	810	346	420
Graphite	22,728	25,472	30,897
Gypsum thousand tons	[r] 884	1,073	815
Kyanite and related materials:			
Kyanite	[r] 52,720	45,279	52,364
Sillimanite	[r] 3,190	2,917	8,278

See footnotes at end of table.

Table 1.—India: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
NONMETALS—Continued			
Lime	428,000	377,000	380,273
Magnesite	r 190,000	265,797	313,453
Mica:			
Processed:			
Exports:			
Blocks	1,018	940	574
Splittings	5,465	6,172	3,518
Condenser films	121	175	136
Washers and disks	230	198	99
Waste and scrap	14,410	18,952	22,457
Powder	7,010	9,081	7,878
Micanite and other buildup mica	16	21	14
Other	42	10	3
Total	28,312	35,548	34,679
Domestic use e	9,600	10,800	10,000
Grand total	37,912	46,348	44,679
Pigments, natural mineral, ocher	53,560	78,666	98,495
Pyrite:			
Gross weight	r 41,500	35,660	50,663
Sulfur content	r 13,820	13,200	18,745
Salt, all types ____ thousand tons	r 7,566	5,273	3,330
Stone, sand and gravel:			
Calcite	23,867	23,622	13,690
Dolomite ____ thousand tons	1,449	1,202	1,450
Limestone ____ do	25,341	25,607	26,061
Quartz and quartzite ____ do	319	322	321
Sand:			
Calcareous ____ do	r 1,004	729	902
Other ____ do	1,458	1,431	1,584
Slate	1,088	943	3,417
Talc and related materials:			
Pyrophyllite	14,912	14,842	14,994
Steatite (soapstone)	210,000	269,000	212,699
Vermiculite	2,709	2,820	2,111
Wollastonite	476	947	1,102
MINERAL FUELS AND RELATED MATERIALS			
Carbon black e	r 61,000	45,000	65,000
Coal:			
Bituminous ____ thousand tons	77,870	r 84,102	95,931
Lignite ____ do	3,320	3,044	2,822
Total ____ do	81,190	87,146	98,753
Coke:			
Coke oven and beehive ____ do	8,898	e 9,200	e 9,200
Gashouse ____ do	55	e 36	e 36
Other, soft ____ do	r 4,100	3,921	e 4,100
Total ____ do	r 13,053	13,157	13,336
Gas, natural:			
Gross production ____ million cubic feet	59,124	67,733	81,576
Marketable production [6] ____ do	r 32,242	25,320	35,244
Petroleum:			
Crude oil ____ thousand 42-gallon barrels	55,388	55,733	61,611
Refinery products:			
Gasoline ____ do	14,870	10,965	10,396
Jet fuel and kerosine ____ do	28,768	22,367	25,307
Distillate fuel oil ____ do	45,558	53,100	53,175
Residual fuel oil ____ do	29,321	28,258	33,859
Lubricants ____ do	4,641	2,772	2,485
Other ____ do	16,747	23,610	25,069
Refinery fuel and losses ____ do	9,711	7,173	10,917
Total ____ do	149,616	148,245	161,208

e Estimate. p Preliminary. r Revised.

[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), and uranium, but production data are not available.

[2] Estimate based on 11 months of data.

[3] Data is for fiscal year Apr. 11, 1972, through Mar. 31, 1973.

[4] Nitrogen content of ammonium sulfate, nitrophosphate, and urea.

[5] P_2O_5 content of superphosphates only.

[6] Includes reinjected gas.

TRADE

The total value of India's exports was $4.6 billion, a gain of 19% over 1974 exports. The mineral industries accounted for $279 million during the first 6 months of calendar year 1975, or about 12% projected to yearend. The export of iron ore and concentrate, mica, and chromite brought in $151 million, $16 million, and $15 million, respectively. Manganese dropped to fourth place, with a value of nearly $11 million.

The total value of imports was $5.9 billion, up 12% over the 1974 value. Mineral imports were valued at $759 million to midyear, about equal to those in the same period in 1974. Nearly 85% of that figure was for imported petroleum. The total imported fuel bill for the year was estimated to be over $1.3 billion. The U.S. share of Indian imports was up 63% to $1.4 billion. The main imports from the United States in 1975 were food grains, $716 million; fertilizers, $186 million; and machinery and transport, $197 million.

Table 2.—India: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1974	1975 [1]
METALS		
Aluminum:		
Bauxite and concentrates	18,264	9,189
Aluminum oxide and hydroxide	32,744	35,717
Metal and alloys:		
Unwrought	26	13
Semimanufactures	4,969	5,430
Cadmium metal including alloys, all forms	10	--
Chromium ore and concentrate	334,364	350,128
Copper:		
Copper sulfate	6	1
Metal and alloys:		
Unwrought	2	10
Semimanufactures	2,447	521
Iron and steel:		
Iron ore [2] thousand tons	21,309	19,726
Iron ore concentrate do	591	937
Scrap do	97	124
Pig iron, shot, pellets do	127	210
Ferroalloys:		
Ferrochrome	4,767	3,115
Ferromanganese	32,961	2,001
Ferrosilicon	2,006	--
Steel ingots and equivalent primary forms thousand tons	4	88
Semimanufactures:		
Bars, rods, angles, shapes, sections do	45	114
Plates and sheets do	5	2
Hoop and strip do	(3)	(3)
Rails and accessories do	11	(3)
Wire do	2	1
Pipes, tubes, fittings do	148	92
Castings and forgings, rough do	4	6
Lead:		
Oxides	627	187
Metal and alloys, all forms	36	33
Manganese ore and concentrate:		
First grade ore	96,175	72,777
Second grade ore	208,454	176,153
Ferruginous manganese ore [4]	729,974	462,954
Manganese oxide	1,472	505
Other	--	20
Molybdenum metal, all forms kilograms	28	--
Nickel:		
Matte	2	--
Metal, including alloys, all forms	13	13
Silicon, elemental kilograms	--	3,668
Silver metal including alloys thousand troy ounces	15,221	39,732
Tin metal including alloys, all forms	62	4
Titanium ore and concentrate:		
Ilmenite	118,634	68,975
Other	--	1,300
Tungsten metals, all forms	16	96

See footnotes at end of table.

Table 2.—India: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1974	1975 [1]
METALS—Continued		
Zinc:		
Oxide	964	55
Metal including alloys, all forms:		
Scrap	(3)	--
Unwrought and semimanufactures	1	537
Other:		
Ores and concentrates:		
Of rare-earth metals	1	310
Of vanadium, molybdenum, columbium, tantalum, zirconium	8,732	2,510
Other, n.e.s	540	--
Oxides and hydroxides, n.e.s	317	158
Metal-bearing residues	940	268
Base metals including alloys, all forms, n.e.s	339	--
NONMETALS		
Abrasives:		
Natural emery, crude	59	96
Natural, n.e.s	27	5
Natural or synthetic dust and powder of gem stones, except diamond	(3)	--
Abrasive wheels, stones and powder	1,403	971
Asbestos	11	38
Barite and witherite	145,078	158,203
Boron materials, boric acid	231	102
Cement, hydraulic	198,020	308,138
Chalk	129	263
Clays and clay products (including all refractory brick):		
Crude:		
Ball clay	414	62
Bentonite	11,602	8,590
Earth clay	1	280
Fire clay	143	141
Fuller's earth	59	110
Kaolin	3,239	1,798
Other, n.e.s	407	404
Products:		
Refractory (includes nonclay refractory products)	6,442	12,809
Nonrefractory	[5] 1,363	[5] 870
Diamond, gem:		
Uncut value, thousands	$13,205	$4,613
Cut do	$104,570	$966,619
Feldspar	9,600	5,589
Fertilizer materials, ammonia, anhydrous and aqueous value	$7,526	$2,835
Gem stones except diamond:		
Natural:		
Uncut:		
Emerald value, thousands	$856	$6,315
Feldspar do	$44	$87
Other do	$4,721	$45,665
Cut do	$18,640	$156,725
Synthetic and reconstituted:		
Uncut do	$59	$185
Cut do	$88	$2,154
Graphite, natural	176	50
Gypsum and plasters	8,144	97
Kyanite and related materials:		
Kyanite, calcined	6,564	7,052
Kyanite, other	18,595	16,498
Sillimanite	829	100
Other	191	2
Lime, quicklime, hydraulic lime	2,784	1,194
Magnesite:		
Crude	498	35
Calcined, excluding dead-burnt	15,416	8,342
Dead-burnt	15	64
Mica:		
Crude:		
In blocks	940	545
Condenser film	137	126
Splittings	6,106	3,392
Scrap and waste	18,952	21,632
Manufactured:		
Condenser film plates	37	8
Washer discs	197	85
Cut sheets and strips	68	30
Micanite and other built up	21	12
Powder	9,081	7,843
Other	9	3

See footnotes at end of table.

Table 2.—India: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1974	1975 [1]
NONMETALS—Continued		
Pigments, mineral:		
Natural, not further described	631	394
Iron oxide	9,064	3,686
Salt	230,502	263,515
Sodium and potassium compounds, n.e.s.:		
Caustic soda	1,755	6,999
Caustic potash	921	49
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked:		
Slate	182	62
Marble	162	498
Other	166,748	48,201
Worked, all types	5,020	2,902
Crushed stone, broken stone, and gravel:		
Dolomite	4,446	3,210
Limestone for lime manufacture	60,727	106,143
Quartz	5,892	2,429
Other	336	445
Sand, excluding metal bearing	26,394	5,583
Sulfur:		
Elemental	411	325
Sulfuric acid	2,796	2,378
Talc, steatite, soapstone	11,566	6,676
Other:		
Crude	689	1,901
Slag and wastes, not metal bearing	19,971	40
Oxides and hydroxides of strontium, barium, magnesium	251	58
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	150	6,067
Carbon black	7,634	1,591
Coal:		
Bituminous	388,769	368,862
Other	--	7,817
Coke	14,791	15,389
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	331	NA
Kerosine and jet fuel ... do	1,051	NA
Distillate fuel oil ... do	229	NA
Residual fuel oil ... do	(3)	NA
Lubricants ... do	9	NA
Other ... do	1	NA
Total ... do	1,621	(6)
Crude chemicals produced from the distillation of coal, oil, and/or natural gas	35,535	69,219

NA Not available.
[1] Data for 11 months only.
[2] Including manganiferous iron ore containing up to 10% Mn.
[3] Less than ½ unit.
[4] Grade: 10%–35% Mn.
[5] Partial figure; excludes materials not reported quantitatively valued at $95,220 in 1974 and $760,000 in 1975.
[6] Official trade statistics for 1975 do not report petroleum refinery products under categories used above. Instead, all products are listed in three categories, as follows, with quantities given in metric tons (not in barrels): Light distillates—23,406; medium distillates—70,736; others—38,528.

Table 3.—India: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1974	1975 [1]
METALS		
Aluminum:		
Alumina	519	444
Metal and alloys, all forms	1,278	7,611
Antimony:		
Ore and concentrate, gross weight	717	687
Oxides	39	23
Metal and alloys, all forms	1	11
Arsenic:		
Crude sulfides	2	2
Oxide and acid	699	472
Elemental	141	13
Beryllium metal and alloys, all forms kilograms	961	1,232
Bismuth metal and alloys, all forms	8	1
Cadmium:		
Oxide	(2)	--
Metal and alloys, all forms	4	5
Chromium:		
Oxide and hydroxide kilograms	50	5
Metal and alloys, all forms	37	49
Cobalt:		
Oxide and hydroxide	15	6
Metal and alloys, all forms	203	107
Copper metal and alloys:		
Scrap	28	579
Unwrought	38,175	16,687
Semimanufactures	2,368	3,132
Iron and steel:		
Iron ore	322	--
Scrap	12,013	13,820
Pig iron, sponge iron, iron and steel powder	672	429
Ferroalloys	1,037	573
Steel ingots and equivalent primary forms	18,246	24,753
Semimanufactures:		
Bars, rods, angles, shapes, sections	217,498	104,070
Sheets and plates	863,706	447,016
Hoop and strip	48,400	24,315
Rails and accessories	8,408	(2)
Wire	9,880	4,005
Pipes, tubes, fittings	56,291	74,710
Castings and forgings, rough	9,051	9,217
Lead:		
Ore and concentrate	18	26
Oxide	38	--
Metal:		
Unwrought	38,805	20,306
Semimanufactures	106	162
Magnesium metal and alloys, all forms	330	245
Manganese:		
Ore and concentrate	2,776	5,430
Oxides	232	22
Metal and alloys	24	64
Mercury 76-pound flasks	9,898	5,619
Molybdenum metal and alloys, all forms	67	43
Nickel:		
Ore and concentrate	--	--
Matte	96	(2)
Metal and alloys:		
Scrap	98	179
Unwrought	1,677	3,043
Semimanufactures	2,396	1,641
Platinum and silver:		
Waste and scrap	--	8
Platinum metal, unwrought and semimanufactures troy ounces	16,156	16,957
Silver metal, unwrought and semimanufactures do	14,558	21,047
Selenium, elemental	13	6
Silicon, elemental	947	984
Tantalum metal and alloys, all forms kilograms	125,030	825
Tin:		
Oxide	9	9
Scrap	394	1,264
Unwrought	1,768	1,845
Semimanufactures	3	2
Titanium oxide	7,416	2,663
Tungsten:		
Ore and concentrate	203	205
Metal, all forms	9	58

See footnotes at end of table.

Table 3.—India: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1974	1975 [1]
METALS—Continued		
Zinc:		
Ore and concentrate	10,321	23,079
Oxide	6	--
Dust	465	1,126
Metal and alloys:		
Unwrought	64,699	35,509
Semimanufactures	79	57
Other:		
Ores and concentrates of vanadium, molybdenum, columbium, tantalum, and zirconium	4	36
Scrap and other wastes, n.e.s	1	3
Metalloids, n.e.s	46	28
Metals, unwrought and semimanufactures, n.e.s	87	61
NONMETALS		
Abrasives:		
Tripoli earths	--	18
Other natural	(2)	--
Dust and powder of natural or synthetic gem stones (except diamond) kilograms	213	82
Grinding and polishing wheels and stones	1,598	710
Asbestos	60,176	39,845
Boron materials:		
Crude natural	5,233	15,929
Boric acid	1	--
Bromine, elemental	1	--
Clays and clay products (including all refractory brick):		
Crude clays:		
Ball clay	1,143	708
Bentonite	13	5
Earth clay	227	279
Fire clay	12	--
Fuller's earth	32	78
Kaolin	310	10
Other	460	349
Clay products:		
Nonrefractory	211	16
Refractory	6,564	3,679
Diamond:		
Gem value, thousands	$61,049	$744,724
Industrial thousand carats	490	670
Diatomite (kieselguhr and infusorial earth)	1,725	1,381
Fertilizer materials:		
Crude, natural: Phosphate rock thousand tons	1,101	546
Manufactured:		
Nitrogenous: [3]		
Ammonium nitrate, ammonium sulfate, and urea, nitrogen content do	1,138	1,365
Other, gross weight	938,935	425,829
Phosphatic	3	57,310
Potassic	571,208	281,557
Mixed	498,472	681,355
Feldspar, leucite, nepheline, nepheline syenite	3	--
Fluorspar, cryolite, chiolite	16,857	4,206
Gem stones (except diamond):		
Natural, uncut:		
Emerald value, thousands	$5,846	$41,837
Feldspar do	(2)	$59
Other do	$859	$5,349
Synthetic and reconstituted, uncut do	$53	$878
Graphite, natural	780	399
Gypsum and plasters	--	4
Iodine, elemental (except colloidal)	310	340
Lime, quicklime, hydrated lime	26	--
Magnesite, crude	1	21
Mica, worked	31	6
Pigments, mineral:		
Iron oxide	811	826
Other	139	252
Salt	1,079	347
Sodium and potassium compounds, n.e.s.:		
Caustic soda	3,981	(2)
Caustic potash, potassium, sodium peroxide	43	5
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	91	18
Worked	13	--

See footnotes at end of table.

Table 3.—India: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1974	1975 [1]
NONMETALS—Continued		
Stone, sand and gravel—Continued		
Gravel and crushed stone: Quartz	27	(4)
Sand, excluding metal bearing	2	11
Sulfur:		
Elemental	588,016	549,246
Sulfuric acid	1	9
Talc, steatite, soapstone, prophyllite	2	17
Other:		
Crude nonmetal ores	10,595	8,243
Oxides and hydroxides of barium, strontium, magnesium	223	91
Fluorine and colloidal iodine	84	10
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s.	1,148	367
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	1,083	519
Carbon black and gas carbon	1,545	1,248
Coal:		
Anthracite	35	2,270
Other	495	--
Coke, all types	563	75
Petroleum:		
Crude oil thousand 42-gallon barrels	103,155	100,918
Refinery products:		
Gasoline do	315	332
Kerosine and jet fuel do	6,603	5,092
Distillate fuel oil do	2,775	4,267
Residual fuel oil do	10,210	5,548
Lubricants do	735	553
Other do	425	--
Total do	21,063	15,792
Crude chemicals derived from the distillation of coal, oil, and/or natural gas	14,104	11,804

[1] Data for 11 months only.
[2] Less than 1/2 unit.
[3] Some nitrogenous fertilizers are reported in terms of contained nitrogen, others in terms of gross weight, thus they cannot be added.
[4] Excludes quantity valued at $256,792.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Reserves of bauxite have steadily increased in the last few years as deposits were reassessed by the Geological Survey of India in connection with the State Governments.[7] Reserves reportedly now stand at over 1 billion tons, the fifth-largest in the world. Most of that amount was in the inferred category, but the Government-owned Minerals Exploration Corp. (MEC), with support from the Geological Survey, was conducting detailed surveys of the deposits in 1976. Significant amounts of the inferred ore should accordingly be reclassified as indicated or measured when the surveys are completed. The following tabulation gives bauxite reserves, by State, in million tons:

State	Measured	Indicated	Inferred	Total
Orissa	--	128	480	608
Andhra Pradesh	43	8	362	413
Maharashtra	52	51	18	121
Madhya Pradesh	59	13	29	101
Bihar	13	11	21	45
Gujarat	22	--	22	44
Other	15	30	11	56
Total	204	241	943	1,388

Bauxite production increased about 14% to 1.27 million tons in 1975. About one-half of the production was metallurgical grade,

[7] U.S. Embassy, New Delhi, India. State Department Airgram A-150, May 21, 1976, pp. 1-12.

assaying in excess of 50% alumina. The number of mines reporting production was 47 compared with 67 in 1974. The mine closings were attributed to the electric power shortage and an accumulation of surplus stocks. Pithead prices declined from $3.29 (Rs 28) per ton in 1974 to $2.70 (Rs 23) per ton in 1975. The States of Bihar, Madhya Pradesh, and Maharashtra together accounted for 83.4% of the bauxite production. Bauxite exports were only about 1% of production.

As a result of the improved reserves, India was looking with confidence toward the development of export-oriented alumina plants. These would not endanger long-range plans for increased domestic aluminum production. Export of alumina rather than bauxite would be in keeping with India's plans to export value-added semiprocessed goods rather than basic raw materials. The Korba plant of Bharat Aluminium Co. Ltd. (BALCO) was the only plant producing alumina primarily for export. Production was about 70,000 tons in 1975, of which an estimated 50,000 tons was exported. BALCO signed an agreement to supply the U.S.S.R. with 40,000 tons in 1976.

Production of aluminum metal increased nearly 24% in 1975 to over 160,000 tons. That was a record high for India and accounted for about 1% of the world total. Plant utilization for India's six operating smelters was about 79% of capacity. An increase in available electric power and improved labor-management relations in 1975 contributed to the increased output. Particularly welcome was the increased supply of electric-conductor-grade aluminum, which had been in short supply in recent years. India's seventh plant, the 9,000-ton-per-year smelter in Asansol, West Bengal, had been closed since 1973, but was expected to be returned to service in early 1976. Total installed capacity for refined aluminum was reported at 246,000 tons per year in 1975.

Aluminum inventories went from 12,000 tons in June 1975 to over 35,000 tons by the end of the fiscal year. To lower inventories, the Government lifted the 5-year-old export ban on aluminum in December 1975. It permitted 15,000 tons of commercial-grade and 5,000 tons of electric-conductor-grade aluminum to be exported in the last quarter of 1975.

BALCO's Korba complex was scheduled to complete its second potline near yearend. The line was to be commissioned in mid-1976, and would double the 1975 capacity of the plant to 50,000 tons per year. Hindustan Aluminium Corp. Ltd.'s 95,000-ton-per-year smelter in Renukoot, Uttar Pradesh, was undergoing expansion. The new line would increase capacity by 25,000 tons per year when completed in 1978.

Chromite.—Total chromite reserves were listed at 13.8 million tons in 1973. The State of Orissa contains over 90% of India's known chromite reserves and contributes over 92% of total production. The mining areas are located about 110 kilometers northwest of the major port of Paradeep, through which most of the chromite exports flow. The reserve figures can be expected to change as more detailed exploration is conducted by the Geological Survey. Also the figures could continue to climb as improved mining technology allows deposits below the present economic limit (40 meters) to be counted as reserves and successfully mined.

Indian chromite production was about 500,000 tons. The high chromium to iron ratio of the ore (3.5 to 1) makes it desirable for the export market, and over 300,000 tons was shipped in 1974–75. Japan purchased about 290,000 tons, and the United States purchased the remainder. Growing domestic use of chromite and the limited amount of known reserves could cause a move toward conserving the ore supply for local consumption, although rising world chromite prices make the export revenue extremely attractive. Chromite was third in mineral export earnings in the first half of calendar year 1975, but reportedly moved past mica into second place by yearend.

Copper.—India's copper ore reserves (measured, indicated, and inferred) were estimated at 350 million tons ranging between 1.0% and 2.5% metal content. While copper deposits were reported in at least 11 of the Indian States, over 91% of the reported reserves occur in Bihar, Rajasthan, and Madhya Pradesh.[8]

Copper ore production was 1.8 million tons, up 28% over that of 1974 and nearly three times the production of 1971. The

[8] U.S. Embassy, New Delhi, India. State Department Airgram A-344, Dec. 30, 1976, pp. 4-12.

principal mines were Rakha Phase I, which serves the Ghatsila smelter in Bihar; and the Dariba, Chandmari, and Kolihan mines, which feed the Khetri smelter in Rajasthan. Ores from the Chandmari and Dariba mines (0.7% Cu) and the Kolihan mine (2.0% Cu) are blended before being beneficiated at the Khetri complex to produce about 12% to 14% copper concentrate.

India's copper-smelting capacity totaled 57,000 tons per year from the Government-owned Hindustan Copper Ltd.'s plants at Ghatsila and Khetri. Production of blister copper reportedly reached a record high of about 24,000 tons, more than double that of 1974. Although the plan for 1976 was 36,000 tons, production is unlikely to exceed 30,000 tons because of reported technical problems with a furnace at Khetri.

Consumption of copper dropped slightly, largely owing to substitution by aluminum. It amounted to 45,000 tons in 1975 compared with 50,000 tons in 1974. Demand for the primary metal was expected to increase gradually to about 100,000 tons by 1986.

As a result of the increased domestic production, Indian imports declined sharply from about 41,000 tons in 1974 to 20,000 tons in 1975. The Government promoted the initial establishment of a copper buffer stock because of rising international prices and as an aid in stabilizing domestic prices. As the result of this, a sharp increase in imports can be expected in 1976, possibly to around 45,000 tons.

The Government plans to continue expansion of the copper industry with the ultimate goal of national self-sufficiency. Planned expenditures for 1976 reportedly include continued development of the Khetri complex ($8 million), expansion of the Mosaboni and Rakha mines ($6 million), and expansion of the Chandmari and Sura mines ($2.7 million). The start of development at the Malanjkhand deposit apparently awaited additional detailed geological investigation by the Geological Survey and MEC. The deposit was believed to contain about 50 million tons of ore at 1.37% copper. The plan envisioned a $106 million investment in a mine and concentration plant. Startup capacity of the mine would be 1 million tons of ore annually with an ultimate capacity of around 3 million tons. The ore concentration plant would be located near Balghat in Madhya Pradesh. If constructed, it would furnish initially about 65,000 tons per year of concentrate to the Khetri smelter.

Gold.—India's gold production in calendar year 1975 was 90,285 troy ounces valued at about $14 million. Production from two mines in the Kolar goldfield accounted for one-half, with the remaining one-half coming from the Hatti mines. The Kolar Fields contain about three-fourths of the proved reserves. New exploration was being conducted by the Geological Survey to try to locate new reserves in the known fields. Some success was claimed in the Mysore mining area, but no firm ore estimates were available. New ore reserves were reported in the Anantpur District of Andhra Pradesh and the Raigarh District in Madhya Pradesh. It was also reported that the copper-zinc deposits at Dikehu in Sikkim have been found to contain 10 grams and 63 grams per ton of byproduct gold and silver, respectively.

Iron Ore.—Iron ore production in India is derived from three main types of mines: Captive mines operated by some of the steel plants; public-sector mechanized mines owned and operated by the National Mineral Development Corp., a subsidiary of the Steel Authority of India, Ltd.; and the smaller, privately owned mines using manual or partly mechanized methods. The latter category comprises about 500 mines, mostly in the State of Bihar and the Billary-Hospet region of Karnataka State. It was reported that the Iron Ore Board had recommended that these small, relatively inefficient operations be amalgamated with either the larger private mines or the public-sector mines. The merging would be done at the time of renewing individual mining leases, and would result in a more economical and efficient operation.

Reserves.—Deposits of all common iron ore minerals occur in India. Hematite deposits were the most important because of the large high-grade reserves. It was the only iron mineral being exploited for use in indigenous steel plants and for export. There are six hematite occurrences in India; the Barajamda region of Bihar and Orissa States contain over one-half of the reserves.[9] Of the 5,613 million tons of reserves, about 1,890 million tons were expected to grade above 62% Fe, and the

[9] Commerce (1935) Ltd. (Bombay). Minerals In Indian Economy. V. 133, No. 3424, 1976, pp. 1–376.

remaining range from 55% to 62% Fe. India ranks fifth in the world in recoverable iron ore reserves. The following tabulation gives Indian hematite reserves at yearend 1975, excluding banded hematite-quartzite deposits, in million tons:

State	Measured	Indicated	Inferred	Total
Bihar and Orissa	1,967	3,007	639	5,613
Madhya Pradesh and East Maharashtra	1,444	279	1,249	2,972
Karnataka	634	22	749	1,405
Goa and South West Maharashtra	124	123	215	462
Andhra Pradesh	--	--	16	16
Rajasthan	--	--	13	13
Total	4,169	3,431	2,881	10,481

The largest single iron ore deposit in the country was recently discovered near Chiria in Bihar State. Reserves were estimated by MEC at 1,970 million tons of 55% to 62% Fe. The ore was composed of about equal proportions of hematite and geothite.

Magnetite ores occur in several areas and are potentially very important. Measured reserves were reported at 1,204 million tons, and the total of all classes was set at 2,748 million tons. Indian magnetite deposits vary in grade from 20% to 70% Fe. Although the grade may be low, the ores are well suited to beneficiation into high-grade pellets by grinding, magnetic separation, and agglomeration. The most extensive deposits were at Kudremukh in Karnataka State.

Production and Exports.—India ranked eighth in the world in production of iron ore and produced nearly 5% of the total world output. Production increased from 35 million to over 41 million tons of iron ore in 1975. Most of India's iron ore was exported, and it was the main foreign-exchange earner for the country. Exports by the Government-owned Minerals and Metals Trading Corp. (MMTC), a subsidiary of the Steel Authority of India, Ltd., were around 12.5 million tons, nearly 80% of which went to Japan. Private shippers in the Goa area accounted for about 10.7 million tons; the remaining ore was processed domestically.

India was actively promoting increased ore sales abroad. MMTC contracted to sell 1.2 million tons of ore to the Republic of Korea over a 5-year period, and an additional 5.6 million tons over a 7-year period beginning in 1976. Under a long-term agreement, India is to supply 7.5 million tons per year of high-grade concentrate to Iran. A total of 210 million tons is to be supplied beginning in about 1981. Ore prices are to be based on a sliding scale related to the world market for iron ore.

Development and Expansion.—The export agreement between India and Iran involves the development of the Kudremukh iron ore deposit in Karnataka State. Iran was to provide a $250 million advance payment for the iron ore in addition to a $630 million credit to finance the cost of the project. Ore reserves at Kudremukh were estimated at 600 million tons. Ore is to be transported about 60 kilometers to the port of Mangalore by India's first major slurry pipeline. Mechanized ore handling facilities are to be constructed, and new berthing areas capable of handling ore carriers up to 60,000 deadweight tons were under development.

The development of the highly mechanized Deposit No. 5 at Bailadila had problems during the year, putting construction well behind schedule. A 2.2-kilometer tunnel crucial to the new workings was being driven through unexpectedly difficult strata. Heavy ground and extremely large flows of ground water into the tunnel slowed progress. The project is to supply 3.6 million tons per year of lump ore for export. Ore from both the new Bailadila 5 and existing Bailadila 14 is to be shipped through the new outer harbor facilities to be opened at the port of Visakhapatnam.

A Japanese steel company reportedly showed interest in collaborating with the Chowgule Co. in developing banded magnetite-quartzite deposits in the Badabudan Hills about 110 kilometers from the port of Mangalore. The project, not far from Kudremukh, is expected to mine 6 million tons per year of ore grading 35% to 40% Fe. It would require a concentration and pelletizing plant and about $500 million in development costs.

An agreement was also reported between Italy and India on the joint establishment of an ore pelletizing plant with a 200,000-ton-per-year capacity. The output would be exported to Italy. No further details were available.

Iron and Steel.—The industrial recession and governmental restrictions on construction adversely affected consumption of finished and semifinished steel, thereby contributing to a large unsold surplus. Stocks of pig iron and steel stood at a record 1.3 million tons at the end of the fiscal year. India's total production of pig iron increased 14% to 8.4 million tons in 1975. Production of salable steel by the major producers increased 18% to 5.7 million tons in the same period.[10] Total production would have been higher but there was considerable idle capacity at electric furnace units of the secondary producers in the private sector. Low domestic demand and lack of profitability compelled many secondary producers to cease production or operate at low capacity utilization.

The major producers continued to increase production in expectation of export sales and under Government pressure, while secondary producers reduced purchases of raw or semifinished steel. Capacity utilization at five of the six major integrated steel mills increased from about 73% in 1974 to 84% in 1975. Capacity utilization at electric furnace units ranged from 20% to 40%. The increase at the five main plants was due to an increased supply of electric power, raw materials, and fuel; improvement in the rail transport facilities; and improvement in the cooperation between management and the labor force. The Government announced a long-term wage agreement with steelworkers, which it hoped would assure harmony until September 1978.

Table 4 summarizes the capacity and 1973–75 production for salable steel at the six major integrated steel mills.

Production and Expansion Outlook.—India planned to raise domestic salable steel production about 16% in 1976 to about 6.6 million tons. The increased production was expected to be exported. Most of the increase should come from the new Bokaro steel plant. In light of excess steel stocks and rather soft market demand, the steel-production target for March 1979 (the end of the present planning period) has been reduced from 9.4 million to 8.8 million tons. In 1975, official policy appeared to favor attaining a minimum 90% capacity utilization, rather than starting additional new steel capacity. Inadequate domestic demand and a shortage of investment funds combined to slow India's steel-development program. The Government reportedly deferred construction of three new steel plants in south India at Salem, Visakhapatnam, and Vijayanagar.

The only new integrated steel mill to be added during the current plan period was the Bokaro plant, which was built with Soviet technical assistance. The first section of the plant was rated at 1.7 million tons

[10] U.S. Embassy, New Delhi, India. State Department Airgram A-23, Aug. 16, 1976, pp. 1–44.

Table 4.—India: Capacity and production of salable steel at major integrated steel mills

	Installed capacity (million metric tons)		Actual production (million metric tons)			Capacity utilization (percent)		
	Ingot	Salable steel	1973–74	1974–75	1975–76	1973–74	1974–75	1975–76
Public sector:								
Bhilai	2.5	1.9	1.68	1.63	1.85	86	86	95
Durgapur	1.6	1.2	.37	.50	.75	31	42	62
Rourkela	1.8	1.2	.74	.80	1.04	61	66	84
Indian Iron and Steel Co	1.0	.8	.36	.42	.50	44	52	62
Bokaro Steel Co. (newly opened)	1.7	1.4	--	--	.15	--	--	10
Private sector:								
Tata Iron and Steel Co	2.0	1.5	1.20	1.45	1.48	80	97	99
Total	10.6	8.0	4.35	4.80	5.77	66	73	[1] 84

[1] Bokaro is not counted in capacity average.

per year. A second blast furnace and hot strip mill were reportedly near completion at yearend 1975. Work was continuing to expand the plant to its planned 4.0-million-ton-per-year capacity. Completion of the first phase took 10 years and reportedly cost over $1,100 million. The current expansion program is expected to cost another $1,100 million before the full capacity is reached.

Bhilai's expansion from 2.5 million to 4.0 million tons is going slowly and will probably be continued into the sixth 5-year plan period (1979–84). There were delays in the supply of equipment from the U.S.S.R. and the domestic supplier.

A defense-oriented superalloys plant was under construction at Hyderabad in Andhra Pradesh State. The plant was scheduled to open by 1980 and was planned to help eliminate the need for imports of high-priced specialty steels used in atomic plants and the aeronautics and electronics industry.

Construction on the new Rourkela Pipe Plant was underway. The plant was scheduled to begin operating early in 1976. The plant is to produce spirally welded pipe from 355 to 1,524 millimeters (14 to 60 inches) in diameter. The plant is to have a capacity of 55,000 tons per year and will be one of the few in the world capable of producing pipe this large in diameter. The output is to be used in the development of India's petroleum industry.

India's first sponge iron plant began operating at Vijayawada in Andhra Pradesh State. India's National Metallurgical Laboratory provided the design and technology for the plant. The plant adapted a rotary cement kiln to reportedly produce 30,000 tons per year of sponge iron from high-grade ore and nonbituminous coal.

Expansion of the ministeel plant program was at a virtual halt. More than 50% of the 202 holders of governmental licenses for electric furnaces had dropped their plans for new units. Less than 100 units were operating and these were finding operation difficult because of low demand, high taxes, and strict regulations. In an effort to help these privately owned plants, the Government announced an excise-tax reduction from Rs200 Rs50 per ton and a relaxation of some of the production controls.

Exports and Imports.—Preliminary trade statistics for the 9 months between April and December 1975 showed a sharp rise in exports of pig iron and steel materials, and a substantial drop in imports of steel. In quantity, India regained its position as a net exporter of iron and steel. Total projected exports for the year were around 900,000 tons, nearly an 80% increase over those of 1974. Although India exported a larger tonnage of steel than it imported, the value of imported steel was projected at over $300 million, far more than the $100 million India earned for its exports. The major markets for Indian steel exports were Japan, 20%; Iran, 18%; Bangladesh, 10%; and Iraq, Saudi Arabia, and Dubai each with 7%. India permitted the import only of previously contracted steel, primarily plates, sheets, seamless pipe, wire, and rods. The major countries supplying India's import needs were Japan, 32%; West Germany, 19%; the United Kingdom, 12.5%; and the U.S.S.R. 6%.

Lead and Zinc.—Total reserves of lead and zinc ores were reported to be about 194 million tons. Measured reserves totaled 113 million tons, with an estimated recoverable metal content of 3.78 million tons of lead and 3.30 million tons of zinc. Nearly 80% of the lead and zinc ore reserves are located in Rajasthan. Significant deposits also occur at Agnigundala in Andhra Pradesh, Ambamata in Gujarat, and Sargipalli in Orissa.

Production of lead-zinc ore was reported to be 714,000 tons in 1975, up about 20% over that of 1974. India's entire production of lead-zinc ore was from two underground mines in Rajasthan, the 1,800-ton-per-day Mochia Magra mine and the 800-ton-per-day Balaria mine. The Balaria mine was undergoing expansion to a 2,000-ton-per-day capacity, which could be achieved by late 1977. Preliminary work was begun on the nearby Baroi mine, which was scheduled to begin operating in 4 years. Ore from the two mines is beneficiated at the site. Lead concentrate is bagged and shipped to the Tundoo lead smelter in Bihar. Production of zinc concentrate was a record 38,000 tons in 1975, up 32% over that of 1974.[11] Development of the Rajpura-Dariba deposits near Udaipur was continuing. A 150-ton-per-day pilot plant was

[11] U.S. Embassy, New Delhi, India. State Department Airgram A-344, Dec. 13, 1976, pp. 12–20.

set up in 1975 for ore-dressing tests. Construction of the 550-meter shaft was underway and an eventual production of 900,000 tons per year was envisioned. A concentration plant was also planned but had not been started.

Zinc metal production in 1975 was from two smelters, one publicly owned and one privately owned. The Government-owned plant at Debari had a capacity of 18,000 tons per year; however, output for the year was reported at over 15,000 tons. A new roaster and other equipment were being installed to increase capacity of the plant to 45,000 tons per year. The private 20,000-ton-per-year capacity Cominco-Binani Zinc Ltd. smelter at Alwaye in Kerala State operates on imported concentrates and produced over 10,000 tons for the year. Total zinc metal output was therefore over 25,000 tons, a 22% increase over that of 1974.

A second public-sector zinc smelter was under construction at Visakhapatnam in Andhra Pradesh. The plant is to be based on the use of imported concentrates and have a capacity of 30,000 tons per year. It will bring India's total capacity to 95,000 tons per year in 1977 when the plant is scheduled for completion.

A major portion of zinc demand continued to be met by imports, despite a steady upswing in domestic production. Imports totaled 34,000 tons in 1975–76. The Government planned to establish a 15,000-ton zinc buffer stock for the first time in 1976–77, and anticipated imports will therefore be much higher, probably around 70,000 tons.

India's only lead smelter is Hindustan Zinc Ltd.'s (HZL) Tundoo plant near Dhanbad in Bihar State. Plant capacity was being increased to 8,000 tons per year from its present 5,400 tons per year. Production for the year was over 4,700 tons, derived from 15,000 tons of concentrate shipped by the Zawar mines in Rajasthan. Construction was underway on a lead smelter at Visakhapatnam. The 10,000-ton-per-year plant was to cost $44 million and be commissioned in late 1977. Plant feed will be domestic concentrate from the Sargipalli lead deposits under development in Orissa and from the Zawar mines.

India's demand for lead was met mainly by imports. These were furnished primarily by Australia, with Canada, Japan, and East Germany supplying small amounts. From imports of more than 37,000 tons in 1974, there was a drop to an estimated 17,000 tons in 1975. This was caused by a temporary drop in domestic demand. An anticipated increase in industrial growth and the Government's intention to build a buffer stock of 15,000 tons is expected to cause a rise in imports to around 27,000 tons in 1976–77.

Manganese.—Manganese ore production was reported at over 1.5 million tons, valued at $12 million. Nearly one-half of that amount would be required for domestic ferromanganese plants to operate at their 265,000-ton-per-year rated capacity. However, production was well under the rated capacity in 1975.

There are about 20 major manganese-ore locations in India, mostly in the southern half of the country. The most important deposits were those in the Balaghat and Chhindwara areas in Madhya Pradesh. These are run by Manganese Ore India Ltd. (MOIL), a company jointly owned by the national Government, two State Governments, and Central Provences Manganese Ore Co., Ltd. The largest single manganese mine in India is MOIL's Balaghat operation, which produces about 75,000 tons yearly. The mines in the Bhandara and Nagpur Districts of Maharashtra across the State border from Balaghat are also major producers. Aggregate ore production from these mines was about 190,000 tons in 1975.

To conserve manganese ore resources for domestic use, the ban on exports of high-grade ore and the ceilings on exports of lower grade ores were continued. MMTC reportedly set a 1-million-ton limit on exports for 1975–76, although actual exports may have been much less. The quota for 1976–77 was to be reduced to 0.7 million tons.

A 1,000-ton-per-year electrolytic manganese dioxide plant was under construction at Trivandrum in Kerala. The plant was scheduled for completion in 1977 and would use waste sulfuric acid from the nearby plant of Travancore Titanium Products, Ltd., in place of commercial acid. Output was to be used domestically in the growing market for dry-cell batteries.

Uranium.—The Government-owned Uranium Corp. of India (UCI) opened a pilot plant for recovering uranium from copper flotation tailings in September. The plant is adjacent to Hindustan Copper Ltd.'s complex in Ghatsila District, Bihar State. About 400 tons per day of copper tailings were processed using wet concentrating tables. The lean uranium values in the copper tailings are upgraded to about 0.12% U_3O_8 with a 50% recovery factor. The concentrate is shipped to UCI's mill at Jaduguda for further processing.

NONMETALS

Cement and Limestone.—Portland cement capacity in 1975 stood at about 21 million tons per year. Fifty-two plants operated during the year, and produced about 16.2 million tons. Five additional plants were reported under construction. Cement was produced in 15 States, but only 7 States accounted for 85% of total production. This had led to unusually high shipping costs for Indian cement because of the long distances involved between the plants and major market areas. Cement prices at the plant were adjusted by the Government on October 1, 1975, to $17.72 per ton, up from $14.83 per ton. After a predetermined allowance for the levy of taxes, packing and freight charges, and retailers' margin, cement was available to the Indian consumer at a uniform price of $36.72 per ton.

Limestone production in support of the cement industry totaled nearly 26 million tons from 97 mines.

Fertilizer Materials.—Greater availability in 1975 of power and fuel directly affected Indian fertilizer output. Production of nitrogenous fertilizers increased 14% to just over 1.2 million tons of nitrogen content. The Nangal and Kanpur plants operated at full capacity, and a number of major plants, including Namrup, Tuticorin, Madras, and Baroda, produced at over 80% of rated capacity during the year. Stocks increased during the first part of the year because high prices made it costly for farmers to use chemical fertilizers. Then, as part of a program to increase agricultural production, the Government reduced fertilizer prices in July. However, because dealers were reluctant to buy large new stocks, consumption was slow to increase. The low cost of recent imports contributed to dealers' expectations that there would be further lowering of prices. The Government then restricted the sale of imported fertilizers in 17 States and assured the merchants that there would be no more price cutting. Consumption of most types was picking up during the latter part of the year.

With the opening of the Kalol and Kandla plants, nitrogen-fertilizer capacity increased to 2.2 million tons per year, and capacity for phosphatic fertilizer, to 687,000 tons per year. Phosphate rock production was about 429,000 tons in 1975, while phosphatic fertilizer production was reported to be 320,000 tons of P_2O_5 content for all forms. Approximately 119,000 tons of this was contained in superphosphate production.

India ranked eighth in the world in fertilizer consumption. Imports of nitrogen and phosphate were up slightly to 950,000 and 326,000 tons, respectively. On the other hand, potash imports dropped about 40% to about 260,000 tons.

India depended heavily on fertilizer imports to meet its needs; however, a large expansion program was started to increase domestic production. During the year, 21 fertilizer projects were reported in various stages of construction or expansion.[12] Total capacity at the end of the 5-year plan ending 1979 was to be over 5 million tons of nitrogen and at least 1.3 million tons of phosphates.

The first fertilizer unit in the country using natural gas as feedstock was to begin operating around yearend. The unit at the Mamrup plant in Assam State would consume about 760,000 cubic meters per day of gas. The design capacity was 385,000 tons of urea and 100,000 tons of ammonium sulphate. HZL recently opened India's first phosphate-rock-beneficiation plant at Udaipur in Rajasthan. The plant was designed to treat 600 tons per day of low-grade ore and turn out a 34% P_2O_5 concentrate. Raw material for the plant was from the Maton phosphate mine, part of the extensive Jhamar Kotra deposits with proved reserves of 41 million tons. The plant was operating at reduced capacity pending expansion work on the nearby zinc smelter.

Mica.—India was the largest producer of high-grade mica in the world and traditionally has furnished over 70% of the world supply of sheet muscovite and

[12] Far Eastern Economic Review, Asia 1976 Yearbook, p. 182.

phologopite. The mica-pegmatite ore bodies occur mostly in Bihar, Andhra Pradesh, and Rajasthan. Indian mica reserves have not been assessed because of their erratic and relatively unpredictable occurrence.[13]

Production of crude mica was reported at over 11,000 tons for 1975, valued at about $2.6 million. The nearly 400 mica mines being worked were mostly small and very labor intensive. More than one-half produce less than 10 tons of mica each year. Mica was 17th in value of all minerals produced in 1975, and second after iron in export earnings during the first 6 months of calendar year 1975.[14] Exports of Indian mica of all grades were about 34,700 tons valued at $22,264,000. The figures were down only slightly in tonnage, but a substantial 21% in value. The market for high-value blocks and splittings dropped the most, reflecting technological changes allowing the increased use of low-priced scrap mica. The growing substitution of ceramics, plastics, and specialized materials in electrical and insulation uses also has contributed to a lessening dependence on natural mica by many nations.

MINERAL FUELS

Coal.—*Organization.*—Since nationalization of the coal mines was completed in 1973, development of coal and lignite deposits has been under Government jurisdiction, except for a few company-owned mines of Tata Iron and Steel Co., Ltd. These mines accounted for less than 1% of total output. In October 1974, the Department of Coal was set up under the Ministry of Energy to oversee the coal sector. On November 1, 1975, as a further step toward integrating and streamlining the structure and management of the coal industry, Coal India Limited (CIL), formerly known as Coal Mines Authority Limited, was established as a holding company under the Department of Coal. CIL subsidiary companies include: Bharat Coking Coal, Ltd. (BCCL), with headquarters at Dhanbad (Bihar); Eastern Coalfields, Ltd; (ECL), with headquarters at Sanctoria (West Bengal); Central Coalfields, Ltd., (CCL), with headquarters at Ranchi (Bihar); Western Coalfields, Ltd., (WCL), with headquarters at Nagpur (Maharashtra); and the Central Mine Planning and Design Institute, with headquarters at Ranchi. In addition to monitoring these companies, CIL's responsibilities include setting production targets, setting guidelines for implementing policy, purchasing equipment, and setting policy for marketing.[15]

The coal industry in southern India is controlled by the Singareni Colleries Company, Ltd. (SCCL). This is a joint undertaking in which CIL holds 45% and the Andhra Pradesh State Government holds 55% of the company. SCCL manages three mining districts that account for 10% of India's noncoking coal production.

Reserves.—India's total coal reserves were estimated at 85.8 billion tons in 1975. Coking coal accounts for about 23% of the total. Roughly two-thirds of the total reserves are located in five large coalfields—Raniganj (West Bengal), Jharia (Bihar), North and South Kananpura (Bihar), and Singrauli (Madhya Pradesh). The western side of the country has few good coal deposits, which causes transportation problems for consumers in southern and western India who must rely on shipments of higher grade coal from over 1,000 kilometers away in Bihar and West Bengal. Coal and lignite reserves (calculated for seams at least 1.2 meters thick and up to 610 meters deep) are as follows, in million tons:

[13] Pages 215–224 of worked cited in footnote 9.
[14] Page 62 of work cited in footnote 6.
[15] U.S. Embassy, New Delhi, India. State Department Airgram A–235, Aug. 29, 1976, pp. 1–39.

	Measured	Indicated	Inferred	Total
Coking coal:				
Prime coking	3,252	1,586	461	5,299
Medium coking	3,793	4,275	1,308	9,376
Weakly coking	1,206	2,600	915	4,721
Total	8,251	8,461	2,684	19,396
Noncoking coal	12,326	23,420	27,629	63,375
Testing coal	161	192	549	902
Lignite	1,869	202	29	2,100
Grand total	22,607	32,275	30,891	85,773

Indian press reports indicated that some impressive new reserves had been found during 1975. A 150-meter-thick coal seam (reportedly the world's thickest) was discovered in the Singrauli coalfield. Altogether, total reserves may be raised to over 100 billion tons when the new finds are more thoroughly explored.

The Government continued its coal exploration program with over 158,000 meters of drilling completed in 1975–76 and over 225,000 meters planned for 1976–77.

Production.—Coal production reached a record high of nearly 100 million tons in 1975–76, an increase of 13% over that of 1974. India ranked sixth in the world in production of coal. The increase resulted largely from greater capital expenditures, $262 million in 1975 versus $154 million in 1974. Improved labor relations in the coal mines also contributed to the increased output. Expansion of bituminous coal production is shown below, in million tons, and million dollars:

Year	Quantity	Value
1971	71.5	285
1972	74.8	305
1973	77.9	314
1974	84.1	473
1975	95.9	606

Of the total production, about 75% came from underground mines. This pattern will probably change as new mines are developed. There were 360 significant underground mines and 95 significant open pits. Plans called for adding 12 new open pit and 40 new underground mines by the end of the present plan period in March 1979. By then, the new, highly productive open pit operations should have increased the proportion of output to about 35% for open pits compared with 65% for underground mines. Since nationalization, many small inefficient mines have been closed or reorganized into larger more efficient units. This has led to the reduction in the number of significant mines from 779 in 1971 to the 455 operating in 1975.

Output per manshift in the Indian coal industry was one of the lowest in the world, approximately 0.69 tons in 1975. This was due to the labor-intensive nature of the industry, particularly in underground mines, and the relative lack of mechanization. As mechanization is increased and heavy trucks and earthmoving equipment are more widely used, output per manshift is expected to climb to 0.8 tons at the end of the fifth 5-year plan and to 1.3 tons by the end of the sixth 5-year plan (March 1984). By comparison, the U.S. average output per manshift in 1975 was over 14 tons. Indeed, many of the highly mechanized open pit mines in western United States produce over 125 tons per manshift.

Supply and Demand.—The highlight of the year in the coal industry was the greater availability for all consumers owing to improved transport and deliveries. Indian railways moved about 80 million tons in 1975, an increase of over 10 million tons from 1974. Coal, chronically in short supply, became surplus for the first time during the last half of the year. By yearend 1975, stocks at pitheads were about 12 million tons, equivalent of 35 to 40 days of production. The Government claimed that these stocks were not excessive, but the planning commission has revised the 1978 target downward from 135 million to 124 million tons. The 1976 target will probably be reduced from 108 million to about 103 million tons. Lower industry and powerplant needs were responsible for surpluses. Steel plants and powerplants accounted for 47% of total coal consumption and were expected to increase their share of the market to about 52% in 1978. Coal accounted for 61% of the total electric power generated in 1975. Consumption by other industries and the household sector will show significant increases in coming years as coal consumption is encouraged over furnace oil, kerosine, wood, and cattle dung. Some of the largest coal consumers are shown in the following tabulation, in million tons:

	1974–75	1975–76	1978–79 [e]
Steel plants	19.7	21.0	28.7
Powerplants	21.4	23.0	35.5
Railway	14.4	14.3	13.5
Cement plants	4.4	4.4	5.1
Brick kilns	2.5	3.3	4.5

[e] Estimate.

Coal washeries play an important role in the coal industry because of the high ash content of India's coal, often in the 20% to 30% range. There are presently 15 washeries in the country with an input capacity of 26 million tons of raw coal. Production of washed coal increased over 12% this year, but the plants were still running at well below rated capacity. Production from a washery generally consists of 70% clean coal (less 17% ash), 20% middlings (35% to 38% ash), and 10% rejects (50% ash). To meet the anticipated demand of the steel industry and to improve the quality of coal for other potential users, plans call for expanding capacity by 10 million tons during the current planning period. BCCL is to build coking-coal washeries at Sudamdih and Monidih, each with a capacity of 2 million tons per year. CCL is to set up a washery at Ramgarh and one at Kedla-Pundi, each with a capacity of 3 million tons per year.

Labor.—By yearend 1975, India's coal industry employed roughly 80% of the 640,000 people engaged in mining and quarrying activities. This was reportedly an increase of nearly 9% over the 1974 workforce. Nearly 54% of the labor force worked in underground mines, 15% worked in open pit mines, and the remaining 31% were engaged in aboveground support activities. The trend toward larger open pit operations is shown in the following tabulation on average monthly employment in thousands:

Year	Underground	Open pit	Aboveground	Total
1971	222.0	38.2	105.3	365.5
1972	231.3	43.1	117.2	391.6
1973	246.8	62.6	139.9	449.3
1974	258.2	73.3	153.3	484.8
1975 [1]	270.0	77.9	157.5	505.4

[1] Through March only.

Employment in coal mines will probably level off during the coming years as workers needed to operate new and expanded mines will tend to offset the surplus manpower created by expanded mechanization and improved efficiency.

Labor relations in the coal industry improved markedly during the year. Strikes, which cost over 720,000 man-days lost in 1974, accounted for only 262,000 man-days during 1975. More attention was given to work pay, fringe benefits, physical working conditions, and mine safety. A flood at the Chasnala mine in December 1975 killed 375 miners. As a result, further strict mine-safety measures are to be implemented during the coming year.

Planned Development.—The Government planned to spend over $264 million in coal mining investment for 1975–76 and $309 million in 1976–77. Most of this was to go toward the purchase of equipment to modernize existing coal mines. Several major long-term projects for coal development were underway or were to start soon.

BCCL plans to expand the Sudamdih and Monidih mines, each to a capacity of 2 million tons per year of coking coal. The combined production from these mines was 400,000 tons in 1975.

Long-term plans of ECL call for six new mines by 1985. The Jhanjra I and Jhanjra II noncoking coal mines were to be the biggest, with planned capacities of 2.8 million and 2.5 million tons, respectively. These were to be developed with Soviet assistance at a cost of about $94 million.

A large project under study by CCL is the development of the Singrauli coalfields in Madhya Pradesh. A new 10-million-ton-per-year Jayant mine is to be developed with Soviet assistance.

WCL plans to restructure the coal production under its jurisdiction. Many existing mines are to be modernized, and abandoned mines are to be repaired and reopened during the sixth 5-year plan.

Exports.—Because of surplus coal stocks, the Government launched a drive to promote the sale of coal abroad. About 440,000 tons were exported during the year and plans for 1976 call for 1.5 million tons to be exported. Paradip and Calcutta were the major ports used for exporting coal but had poor facilities for handling large tonnages. Mechanized port handling facilities were being developed at Haldia and Paradip. Haldia is located about 80 kilometers downstream from Calcutta and will have an exclusive coal berth with modern mechanized handling equipment. Annual loading capacity is to be 3.5 million tons with a potential of 5.0 million. When Haldia is commissioned, probably in early 1977, India should be in a good competitive position to sell increasing quantities of selected grades of coal to Western Europe and nearby Asian countries.

Lignite.—Most of India's lignite deposits are in Tamil Nadu State. However, the Geological Survey of India recently conducted geophysical surveys in the lignite areas and felt that reserves are considerably higher than the 2.1-billion-ton figure. Nearly all the lignite mined was from the Government-owned Neyveli Lignite Corp. (NLC). Production was reported at 2.8 million tons in calendar year 1975, a 15% drop from the 1974 figure. The NLC complex was established with Soviet collaboration in 1956 to exploit the lignite deposits for power generation and feedstock for the fertilizer industry. The open pit mine is designed for an ultimate capacity of 6.5 million tons per year in 1980. Production has not been enough to meet demands, and the Government decided to substitute fuel oil as feedstock to the fertilizer plant, a $16 million conversion. NLC has operated at a loss since its inception, with a cumulative deficit of $96 million. Losses have been declining recently and it was anticipated that NLC should begin to break even when the full 6.5-million-ton capacity of the mine is reached.

Petroleum and Natural Gas.—On January 13, 1975, the Government announced the establishment of an 11-member Oil Industry Development Board to raise funds for developing India's oil resources. Oil exploration and refining operations are to receive special attention. The board is expected to finance projects of the Oil and Natural Gas Commission (ONGC), Indian Oil Corp. Ltd., and the Indian Petrochemical Corp. These three Government-owned organizations would be responsible for implementing the projects, but the board would approve and monitor expenditures. The board was expected to receive funds for development from the oil tax imposed in July 1974 on domestic production of crude oil.

The Government announced in the fifth 5-year plan that its budget for petroleum development had been increased to $1.9 billion for the period, up from the original $470 million. The expenditure for 1975 will be aimed largely at development off the northwest coast of India.

The Government is negotiating for the purchase of refining, storage, and marketing facilities of the Burmah-Shell operation in India. Reportedly, over $60 million has been offered for the operation.

ONGC had interests in Iran, Iraq, and Tanzania. The Iranian venture has operated since September 1969. India's one-sixth interest in the Rostam offshore oilfield had produced about 3.8 million tons by the beginning of 1975. Production of the field is declining and India's share over the 1975–79 period was expected to be about 2.2 million tons. The venture has reportedly been marginally profitable because of the high Iranian tax rate. Iran was considering a lower tax rate on small fields, and ONGC could realize a profit if the change is approved.

ONGC had an agreement with the Iraq National Oil Co. to explore in a 4,200-square-kilometer area west of Basra near the Saudi Arabian border. Over 1,200 line-kilometers of seismic survey had been completed and the first well was spudded on August 14, 1975.

ONGC operations in Tanzania were the most recent foreign development. ONGC spudded its first well on the island of Songo Songo. The search was for natural gas and the drilling contract was on a daily rate.

Production and Reserves.—Domestic production of crude oil climbed modestly in 1975 to about 8.4 million tons, equivalent to one-third of the total used. India's output of crude oil is expected to increase steadily during the fifth 5-year plan. ONGC holdings accounted for an output of over 5 million tons of crude oil, and the joint sector, India Oil Comp., Ltd., accounted for over 3 million tons. The most important single producer was the Ankleshwar oilfield in Gujarat State, which yielded over 3 million tons. Oilfields in northern Gujarat produced an additional 1 million tons and will be counted on to maintain the State's overall production when output at the older Ankleshwar Field begins to decline in the next few years.[16]

Reserve figures vary widely and are sub-

[16] U.S. Embassy, New Delhi, India. State Department Airgram A-208, July 17, 1976, pp. 1–41.

ject to constant revision because of the Government's extensive exploration program. Proven reserves at the beginning of the year were believed to be about 2.4 billion barrels, most of which were in the offshore areas in northwest India. Potential resources are much higher, of course, with some sources giving figures in tens of billions of barrels.

Gross production of natural gas was about 2.3 billion cubic meters. Because of a lack of adequate pipeline facilities, however, only about 4 out of every 10 cubic meters produced were actually sold. The remainder was flared or reinjected to maintain oilfield pressure. Total proven reserves were reported in 1975 at about 100 billion cubic meters, with offshore deposits accounting for about one-third of that figure.

Imports.—The cost of petroleum imports reached a record high of $1.35 billion during 1975, up 3% over the 1974 level. Nearly 14 million tons of crude oil and over 2 million tons of petroleum products were imported in 1975. Fiscal incentives were introduced by the Government early in the year to encourage the replacement of oil-fired equipment with coal. These proved effective and allowed a 45% decrease in importation of heavy furnace oil. India obtained crude oil from the following sources: Iran, 5.85 million tons; Saudi Arabia, 4.18 million tons; Iraq, 2.9 million tons; and Abu Dhabi, 1.0 million tons. Projected imports for 1976 were placed at 13.2 million tons, with Iran and Saudi Arabia again being the main suppliers. Imports of petroleum products for 1976 were planned to be about 2.5 million tons, mainly from Kuwait and the U.S.S.R.

Exploration.—Of major importance was the rapid exploration and development of the offshore oilfield discovered in the Bay of Cambay in an area known as the Bombay High. Production platforms were being built by J. Ray McDermott Co. about 180 kilometers west of Bombay during the year.[17] The first commercial production is scheduled for shortly after yearend. Full development of the field was expected to cost over $600 million and will entail at least four platforms, a flare tower, a processing unit, and underwater pipeline connections. Ultimate production is now forecast at 200,000 barrels per day, with proved reserves now reported at about 1.5 billion barrels. A single-buoy mooring system will be installed along with an 87,000-deadweight-ton storage barge to allow tankers to load crude oil for shipment to a coastal transhipment point. Eventually a pair of pipelines are planned to bring the separated oil and natural gas ashore to a point near Bombay. The Bombay High crude oil is API 39° to 44° and less than 1% sulfur. The relatively high wax content contributes to a 30° C (86° F) pour point. This will require consideration in the design of the handling, transportation, and processing facilities for the crude oil.

A nearby area called the "Bassein structure" was being drilled at yearend. The area is geologically similar to the Bombay High and may contribute additional production and reserves.

The Government has divided its offshore area into 10 blocks for exploration purposes. So far it has awarded three blocks to foreign oil companies on an Indonesia-type production-sharing basis, with ONGC as a participating partner in some cases. These include the Natomas-Carlsberg Group (Natomas), representing a consortium of five U.S. and two Canadian companies; the Reading and Bates Group of three U.S. firms; and the Asamera Group, representing three Canadian companies.

Natomas had been surveying since May 1974, and began drilling in September 1975 in a 28,000-square-kilometer tract in the Bay of Bengal off India's northeastern coast. ONGC has a 15% equity in the group, with an option to acquire an additional 10% if a commercial discovery is made.

Reading and Bates had a 28,000-square-kilometer concession in the Gulf of Kutch off the northwestern coast of India. ONGC also had an option to acquire 10% in the event of an oil discovery. The first well was begun in October 1975, and results of the drilling were being analyzed at yearend.

Asamera was the latest foreign group to be awarded a concession. The area covers 26,000 square kilometers in the Cauvery Basin off the southeastern coast, north of Sri Lanka. The Government has a 25% interest, with an option to increase that to 50% if desired. Seismic survey work was reportedly underway at yearend.

The Government increased its onshore exploration program and had 40 rigs operating in 1975. Additional rigs were on

[17] Himachal Times (Dehra Dun, India). India's Oil Potential. July 1976, p. 122.

order from the U.S.S.R., Romania, and the United States. Some of these were to be high-capacity units capable of drilling to as deep as 6,000 meters. Some of the older rigs will be phased out as the modern equipment is received. Surveying and drilling was to be conducted in Tripura, West Bengal, Jammu and Kashmir, the Ganga valley, Punjab, Himachal Pradesh, Tamil Nadu, Maharashtra, and Rajasthan.

Pipelines.—India's first major pipeline was commissioned in 1962 to move crude oil from upper Assam State to the Barauni refinery in Bihar State. Since then, both crude and product pipelines have been constructed to facilitate the flow of petroleum between oilfields, refineries, and distribution centers. Crude oil and product pipeline mileage now totals 3,360 kilometers. Most crude oil is moved by pipeline, but products were still moved mostly by rail and highway. Product lines carried about 3.7 million tons, or about 17%, of the refinery throughout in 1975. Plans called for a major building program to upgrade the extent and capacity of the overall system.

The most important project on which work was ready to begin was a system to move crude oil from Salaya in the Gulf of Kutch to the new Mathura refinery. A branch line would also feed the Koyali refinery. The project would include an offshore terminal, a submarine pipeline to shore, and a crude oil storage depot to feed the pipeline. The line was to be over 1,200 kilometers long and would cost an estimated $209 million at 1975 prices. Design work was completed, and construction of support facilities began around yearend. Actual pipelaying on the first section, from Salaya to Viramgram, was to begin in late 1976. The line would use imported Middle East crude oil, but would also be available for input from tankers from the Bombay High oilfields.

A project under urgent consideration in 1975 was a pipeline linking the offshore Bombay High fields with the mainland. No decision was made on whether separate oil and natural gas lines would be laid or a single two-phase pipeline would be constructed. In either case, the project was vital to the efficient development of the offshore fields. Project costs were estimated to be at least $500 million.

During the year plans were completed for looping a 600-kilometer section of the existing 1,157-kilometer Nahorkatiya-Baravni crude oil pipeline in northeast India. The increased capacity would allow higher production from the Assam oilfields. Construction was to begin early in 1976.

Refining.—Ten refineries were operating in 1975—five Government owned, three jointly owned, and two privately owned. Total throughput capacity at yearend was 27.4 million tons per year. During 1975, however, the actual amount of crude oil processed was about 21.8 million tons, up about 5% over that of 1974. This underutilization was attributed to the Government's crude oil import restrictions following the sharp rise in petroleum prices in 1973. Despite the current underutilization of capacity, the Government is looking to future demands and plans to expand present refining capacity 10 million tons per year by 1980–81.

Two major projects were underway during 1975, and one was completed. The most important is the Mathura refinery project, a 6-million-ton-per-year plant to be built with both Soviet and U.S. technical assistance. The refinery, which is located about 130 kilometers south-southeast of New Delhi in Uttar Pradesh State, is expected to be completed in 1980. The plant was to operate on imported Middle East crude oil and domestic crude oil from the offshore Bombay High Field. The Soviet contribution to the project includes design and construction of the atmospheric and vacuum distillation units, construction of the visbreaker unit, bitumen blowing unit, and off-site facilities. The non-U.S.S.R. portion, much of it by a U.S. firm, consists of the processing expertise for the fluid catalytic cracker, Merox units, visbreaker, desalters, powerplant, and antipollution facilities. Total cost of the project was set at $170 million, revised upward from the original $108 million estimate.

The other project is expansion of the Koyali refinery (also referred to as the Gujarat or Baroda refinery) in Gujarat State from 4.3 million to 7.3 million tons per year. The work began in 1975; site preparation, water supply, and power facilities were completed by yearend. Construction of the footings for storage tanks was underway at yearend also.

The 2.5-million-ton-per-year Haldia refinery, 60 kilometers southwest of Calcutta, was completed, and began its first year of operation with no apparent problems.

The Mineral Industry of Indonesia

By K. P. Wang [1] and Emily Perreault [2]

The economy of Indonesia,[3] particularly its balance-of-payments position, came under pressure in 1975 from three directions—the world recession, the liquidity crisis of P.T. Pertamina (the giant State oil corporation), and high import demand. Many of Indonesia's exports met resistance in demand and price. The Government had to pay off legitimate obligations of Pertamina, and slow down Pertamina-oriented development projects. Imports remained high in quantity, and moved up sharply in price. Inflation continued at 20%. Depressed by recession abroad and uncertainties at home, new foreign investment was low in 1975. However, the economy and foreign-exchange situation improved near yearend, and the rice harvest turned out well also. With the successful conclusion of the first 5-year plan, the Indonesian Government embarked optimistically upon the second 5-year plan covering fiscal 1974 (April 1974 to March 1975) to fiscal 1978.

The oil industry was down only slightly in output, and this was compensated for by some increase in prices. Indonesian petroleum exports in 1975 were worth $5.3 billion,[4] close to the 1974 level. The president-director of Pertamina was replaced in 1975, and the oil firm was reorganized. A new Inspectorate Div. was created to place restrictions on Pertamina's participation in new joint ventures and subsidiary activities, reducing the company's involvement in costly non-oil-related activities. Responsibility for fertilizers passed from Pertamina to the directorate general for chemical industries. P.T. Krakatau Steel was removed from Pertamina and reduced in scope. The proposed Batam Island refinery, formerly under Pertamina, was delayed and was to draw on private capital. However, Pertamina's liquefied natural gas (LNG) plants, particularly the Badak plant, and the new Cilacap refinery, were moving ahead. President Suharto announced in his budget speech on January 7, 1976, that the Government would seek to increase its oil revenues 7.6% through a reduction in unit profits by oil companies. The outlook for Indonesian oil and gas in 1976 is for retrenchment in certain areas, consolidation in others, and an overall modest improvement in production.

Low world demand and prices dulled activities in tin and copper during the year. P.N. Timah, the State tin enterprise, slowed its investment activities after completing expansion of its smelter. Freeport Indonesia, Inc., temporarily shelved its plans to develop underground copper operations, although tin and copper prices have since improved. In July 1975, the Asahan aluminum and hydro project was finalized between a Japanese consortium and P.N. Aneka Tambang—the Government nonfuel, nontin enterprise.

In October, the State coal mining enterprise, P.N. Batubara, signed a pioneering production-sharing contract with Shell Mijnbouw N.V. to govern coal exploration and development in south and central Sumatra. P.T. International Nickel Indonesia (P.T. INCO) was about to finish a nickel matte operation in South Sulawesi. The P.T. Pacific Nikkel project for Gag Island awaited an assessment by the

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[3] U.S. Embassy, Jakarta, Indonesia. Industrial Outlook Report: Minerals. State Department Airgram A-87, June 1, 1976, 37 pp.

[4] Where necessary, values have been converted from Indonesian Rupiahs (Rp) to U.S. dollars at the rate of Rp415=US$1.00.

Pacific Bechtel Corporation. The Aluminum Company of America (Alcoa) backed out of its bauxite and alumina project in West Kalimantan, but Aneka Tambang moved ahead on its large alumina plant to utilize the off-grade bauxite.

Indonesia was deliberating the "Third-Generation Contract of Work" to be offered foreign mining companies, which probably will mean fewer safeguards and incentives. The principal anticipated changes include a requirement that foreign earnings be repatriated to Indonesia and converted to rupiahs, and the imposition of export taxes on mineral commodities. There is also the question of Indonesian equity participation in mining projects; 51% is the long-term objective. So far, the policy is to seek minority shares, which are to be held by Indonesian State mining companies.

Indonesia is a member of the International Tin Council (ITC), International Bauxite Association (IBA), the Organization of Petroleum Exporting Countries (OPEC), and International Council of Copper Exporting Countries (CIPEC). The country is generally sympathetic to views of developing nations within these international organizations, although it also welcomes the principle of producer-consumer consultation. Indonesia is prominent in ITC, and would welcome U.S. participation in the fifth tin agreement.

A ministerial-level Committee on Natural Resources Inventory and Evaluation was established. Areas of concern include marine, land, human, and energy resources, and their impact on future economic development. Energy has received the most attention, since petroleum sales dominate the Indonesian economic structure. Oil's influence on the economy goes beyond exports, however; domestic consumption has risen to about one-fifth of output. To serve the well-being of the Indonesian population and stimulate industrial development, petroleum prices are subsidized and producers are often asked to sell a share of their output at discount prices. Yet, local oil use cannot go unrestrained, and Indonesia's premium low-sulfur crude oil might be more valuable sold than used; thus, the concept of energy policy started to emerge in 1975. Indonesian coal mines were being expanded for this reason, along with the investigation of geothermal potential and the hope of introducing nuclear power by the 1980's. Indonesian officials were considering no further foreign ventures in coal exploration and mining for the time being.

PRODUCTION

Indonesia's mineral production showed a nominal decline in oil and tin; slight drops in copper, nickel, and iron sands; a sharp reduction in bauxite; a good increase in coal, but from a small base; and healthy buildups in construction materials, particularly granite, a new product. International oil sales were sluggish, and there were quota problems with tin. Smelter tin output increased significantly. Copper prices were sharply down, forcing the sole producer to reevaluate plans. Now production capacity was being readied in nickel so that Indonesia will not remain just a producer and exporter of ore. Cement production was up by well over 10% as Indonesia embarked on a program to greatly expand capacity. The fertilizer industry is being built up tremendously to utilize the available natural gas. Indonesia's tin, oil and, potentially, nickel are of considerable world consequence.

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

Commodity [1]	1973	1974	1975 p
METALS			
Aluminum, bauxite, gross dry weight ------- thousand tons --	r 1,299	1,290	993
Copper, mine output, metal content	r 31,618	65,444	e 63,079
Gold metal [2] ---- troy ounces --	r 14,645	8,519	10,320
Iron and steel, iron sand, dry basis	r 280,938	365,226	352,991
Manganese ore	r 16,085	18,228	13,871
Nickel, mine output, metal content [3]	20,816	21,093	19,224
Silver [4] ---- thousand troy ounces --	r 316	206	153
Tin:			
Mine output, metal content	22,297	25,630	25,346
Metal	14,623	15,066	17,825
NONMETALS			
Asbestos	--	283	--
Cement, hydraulic ---- thousand tons --	r 730	831	1,050
Clays, kaolin powder	r 29,054	25,972	25,132
Diamond:			
Industrial e ---- thousand carats --	r 12	12	12
Gem e ---- do ----	r 3	3	3
Total e ---- do ----	r 15	15	15
Fertilizer materials:			
Crude, phosphate rock	819	5,563	7,902
Manufactured:			
Nitrogenous	56,955	111,626	402,440
Other including mixed	199,759	117,020	116,635
Ammonia	1,291	3,007	59,728
Gypsum e	8,000	(5)	--
Iodine ---- kilograms --	19,357	25,933	33,077
Salt, all types e ---- thousand tons --	37	70	70
Stone:			
Limestone ---- do ----	6 996	1,114	1,374
Quartz	52,805	68,403	69,222
Sulfur, elemental [7]	r 1,951	2,350	3,943
MINERAL FUELS AND RELATED MATERIALS			
Asphalt rock, bitumen content e	r 95,149	75,170	75,170
Carbon black e	r 1,361	2,722	3,175
Coal ---- thousand tons --	149	156	206
Gas, natural:			
Gross production ---- million cubic feet --	r 184,059	202,335	222,227
Marketed ---- do ----	r 28,425	34,801	82,224
Natural gas liquids:			
Propane and butane ---- thousand 42-gallon barrels --	10	e 12	--
Natural gasoline ---- do ----	33	e 38	--
Petroleum:			
Crude ---- do ----	488,536	501,838	477,055
Refinery products:			
Gasoline ---- do ----	12,819	14,042	15,759
Jet fuel ---- do ----	960	1,510	1,100
Kerosine ---- do ----	19,495	22,036	22,425
Distillate fuel oil ---- do ----	14,904	19,088	20,903
Residual fuel oil ---- do ----	3,394	12,159	11,820
Lubricants (including grease) ---- do ----	32	32	31
Other:			
Liquefied petroleum gas ---- do ----	104	194	336
Petroleum wax ---- do ----	760	788	284
Naphtha ---- do ----	1,225	4,384	3,409
Unfinished oils requiring further processing do ----	58,937	43,694	32,570
Unspecified ---- do ----	757	1,193	2,361
Refinery fuel and losses ---- do ----	4,383	6,387	2,381
Total ---- do ----	117,770	125,507	113,379

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) 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] Revised to none.

[6] 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.

[7] Sulfur produced by other than Frasch process.

TRADE

Indonesia has always had a strong balance-of-payments position because of its exports. For example, in 1974, exports were about $7.4 billion, compared with imports of approximately $3.9 billion. Total exports in 1975 dropped to about $7.1 billion because of world economic difficulties. On the other hand, imports rose to $4.8 billion. The balance of payments was rather muddled in 1975, with the Pertamina financial crisis weakening Indonesia's overall position.

Minerals and particularly oil were of overriding importance in total exports. Oil represented nearly 75% of all 1975 exports in value, and other minerals added another 4%. Gross receipts from Indonesia's mineral exports are tabulated below, in million dollars:

Item	1973	1974	1975
Petroleum	1,609	5,211	5,311
Tin	89	173	154
Copper concentrates	59	125	74
Nickel ore	10	14	21
Bauxite	7	7	6
Other minerals	3	3	4
Nonminerals	1,436	1,892	1,539

Specific tonnages of mineral exports and imports are shown in tables 2 and 3, respectively.

Table 2.—Indonesia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodtiy	1973	1974	Principal destinations, 1974
METALS			
Aluminum, bauxite and concentrate	1,286,858	1,260,971	Japan 1,257,971.
Copper:			
Scrap	2,061	1,967	Japan 1,885.
Concentrate, gross weight	84,950	239,946	Japan 180,523; West Germany 59,269.
Iron and steel scrap	21,133	18,179	Japan 6,401; Republic of Korea 5,421; Taiwan 4,235.
Manganese ore and concentrate	248,061	388,762	Japan 385,499.
Nickel ore and concentrate	566,562	928,368	All to Japan.
Silver metal including alloys troy ounces	833,764	184,545	Japan 170,399.
Tin:			
Ore (including slags and ash)	9,294	11,752	All to Malaysia.
Metal including alloys, all forms:			
Scrap	188	1,054	Japan 1,037.
Unwrought	14,173	15,412	Japan 6,684; Netherlands 4,836; United States 2,920.
NONMETALS			
Sulfur	10	--	
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude thousand 42-gallon barrels	365,267	405,134	Japan 239,377; United States 108,040.
Refinery products:			
Gasoline, motor do	1,347	[1] 258	United States 159; Liberia 26.
Kerosine, white spirit do	50	[2] 69	Liberia 13.
Distillate fuel oil do	782	[3] 578	Liberia 175; United Kingdom 152; Norway 87.
Residual fuel oil do	55,488	38,413	Japan 31,199; United States 3,946.
Other, paraffin wax do	520	587	Singapore 407.
Total do	58,187	39,905	

[1] Total includes 55,677 barrels reported as exported to unspecified countries.
[2] Total includes 51,500 barrels reported as exported to unspecified countries.
[3] Total includes 43,657 barrels reported as exported to unspecified countries.

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

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	6	5	All from United States.
Oxide and hydroxide	7,138	6,362	Japan 4,477; West Germany 611.
Metal including alloys:			
Scrap	139	63	People's Republic of China 36; Malaysia 20.
Unwrought	2,674	4,701	United States 1,974; Australia 976; Canada 808.
Semimanufactures	19,315	21,061	Japan 5,007; Belgium-Luxembourg 3,774; United Kingdom 2,747.
Arsenic trioxide, pentoxide, acids	82	106	France 47; West Germany 38; United States 21.
Beryllium metal including alloys, all forms	2	--	
Chromium oxide and hydroxide	93	56	West Germany 45; Hong Kong 6.
Cobalt oxide and hydroxide	109	9	West Germany 5; Netherlands 3; United Kingdom 1.
Columbium and tantalum, tantalum metal including alloys, all forms	2	--	
Copper:			
Matte	3	5	Mainly from Belgium-Luxembourg.
Copper sulfate	195	61	Belgium-Luxembourg 26; West Germany 20.
Metal including alloys, all forms	6,020	6,751	West Germany 1,702; Japan 1,701; Australia 1,540.
Iron and steel:			
Ore and concentrate	5	50	Japan 45; Sweden 5.
Scrap	16,138	12,739	West Germany 7,395; Taiwan 1,000.
Pig iron, ferroalloys, similar materials	22,325	9,532	Australia 3,410; West Germany 1,996; Canada 1,068.
Steel, primary forms	67,255	187,203	Japan 134,323; Republic of Korea 24,118.
Semimanufactures:			
Bars, rods, angles, shapes, sections	409,280	425,293	Japan 249,388; West Germany 32,048.
Universals, plates, sheets	366,498	339,347	Japan 269,529.
Hoop and strip	53,695	38,317	Japan 35,188.
Rails and accessories	11,348	18,676	Japan 7,899; Australia 6,046; West Germany 2,021.
Wire	44,792	17,560	Japan 9,437; People's Republic of China 3,780.
Tubes, pipes, fittings	176,267	163,128	Japan 109,216; United States 35,263.
Castings and forgings, rough	348	1,378	Japan 697; United Kingdom 274; Republic of Korea 205.
Lead:			
Oxides	496	283	Australia 183; United Kingdom 40.
Metal including alloys, all forms	3,023	2,235	Australia 1,567.
Magnesium metal including alloys, all forms	29	7	West Germany 6; Canada 1.
Manganese:			
Ore and concentrate	3,725	3,281	Singapore 3,025.
Oxides	3,983	3,464	Japan 2,461; Belgium-Luxembourg 865.
Mercury ---- 76-pound flasks	87	--	
Nickel:			
Matte, speiss, similar materials	2	--	
Metal including alloys, all forms	1,495	1,954	West Germany 1,032; Canada 765.
Platinum-group metals including alloys, all forms -- thousand troy ounces	1,093	(1)	All from United Kingdom.
Tin metal including alloys, all forms	134	188	Japan 102; Singapore 66.
Titanium oxides	4,469	4,798	Japan 2,709; West Germany 617; United Kingdom 481.
Tungsten metal including alloys, all forms	176	68	United Kingdom 67.
Uranium and thorium oxides, including rare-earth oxides	77	17	France 7; United Kingdom 4; People's Republic of China 2; United States 2; West Germany 2.
Zinc:			
Oxide	2,468	2,628	United States 595; Australia 592; West Germany 305.
Metal including alloys:			
Scrap and blue powder	463	866	Australia 727; Netherlands 100.
Unwrought and semimanufactures	25,854	22,253	Australia 12,669; Japan 5,455.

See footnote at end of table.

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

Commodity	1973	1974	Principal sources, 1974
METALS—CONTINUED			
Other:			
Ash and residue containing nonferrous metals	11	25	All from Japan.
Oxides, hydroxides and peroxides of metals, n.e.s	304	238	Singapore 71; United States 51; Malaysia 50.
Metals including alloys, all forms: Metalloids	343	225	Singapore 77; West Germany 71; United States 37.
Alkali, alkaline earth, rare-earth metals	32	93	United States 78.
Pyrophoric alloys, ferrocerium	42	51	People's Republic of China 14; Austria 14; Japan 11.
Base metals including alloys, all forms, n.e.s	33	29	West Germany 11; Japan 8; Taiwan 5.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	320	288	Netherlands 114; West Germany 61; United States 42.
Dust and powder of precious and semiprecious stones	1	9	Mainly from Taiwan.
Grinding and polishing wheels and stones	383	617	West Germany 137; People's Republic of China 128; Japan 126.
Asbestos	3,797	6,488	Canada 4,016; Australia 777; Singapore 511.
Barite and witherite	46,950	62,506	Thailand 33,547; United States 15,549; Singapore 9,052.
Boron materials:			
Crude natural borates	161	190	United States 188.
Oxide and acid	92	84	United States 41; India 22; Taiwan 10.
Cement thousand tons	1,497	1,738	Japan 607; Thailand 405; Republic of Korea 319.
Chalk	100	429	France 146; Belgium-Luxembourg 100; West Germany 87.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s., kyanite	16,619	17,241	United States 6,248; Singapore 3,998; Japan 2,784.
Products:			
Refractory (including nonclay bricks)	21,629	15,137	Japan 4,051; United Kingdom 2,831; Taiwan 2,680.
Nonrefractory	4,215	7,525	Japan 2,316; West Germany 1,502; People's Republic of China 1,017.
Cryolite and chiolite	96	31	All from People's Republic of China.
Diatomite and other infusorial earth	1,014	337	United States 198; Republic of Korea 70.
Feldspar, leucite, nepheline	1,068	1,355	Italy 907; Taiwan 187; People's Republic of China 176.
Fertilizer materials:			
Crude:			
Nitrogenous	84	7,081	Japan 7,056.
Phosphatic	3	3	West Germany 2; Japan 1.
Potassic	6	1,687	All from West Germany.
Manufactured:			
Nitrogenous	364,405	815,126	Japan 286,991; Poland 117,917.
Phosphatic	229,664	253,130	Netherlands 70,488; United States 64,443.
Potassic	72,925	72,109	Canada 20,560; West Germany 18,355; Singapore 14,174.
Other including mixed	6,680	11,752	Yugoslavia 11,718.
Ammonia	r 170	124	Netherlands 69; Singapore 31.
Graphite, natural	158	142	Japan 87; West Germany 37.
Gypsum and plasters	31,586	32,306	Australia 20,439; Thailand 10,501.
Lime	490	5,410	Thailand 4,845.
Magnesite	138	179	United States 59; West Germany 56; Japan 26; Netherlands 26.
Mica, all forms	469	999	United States 406; Japan 356; West Germany 174.
Pigments, mineral:			
Natural, crude	308	539	People's Republic of China 472.
Iron oxides, processed	639	1,240	People's Republic of China 652; United States 183; West Germany 178.

See footnote at end of table.

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Precious and semiprecious stones, except diamond, manufactured value	$1,000	$23,000	All from Japan.
Salt and brine	4,956	12,213	India 9,384; United States 1,408.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	51,004	27,073	United States 8,909; Netherlands 3,486; Japan 3,811.
Caustic potash, sodic, potassic peroxides	8,361	6,128	Japan 1,876; United States 1,513; Netherlands 933.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	5,801	25,468	Malaysia 21,874; Singapore 3,248.
Worked	6,714	3,986	Japan 2,635; Singapore 526; People's Republic of China 443.
Dolomite, chiefly refractory grade	1,101	2,656	Taiwan 2,500.
Gravel and crushed rock, n.e.s	4,049	1,151	Singapore 851; Malaysia 114.
Limestone (except dimension)	20,829	901	Thailand 528; Singapore 217; Japan 129.
Quartz and quartzite	110	311	United States 176; Japan 50; Taiwan 50.
Sand, excluding metal bearing	1,887	6,965	Singapore 6,143; United States 619.
Sulfur:			
Elemental:			
Other than colloidal	28,092	28,843	Canada 27,380; Singapore 860.
Colloidal	16,301	13,550	Japan 7,091; Canada 5,080.
Sulfur dioxide	770	25	West Germany 18; United States 7.
Sulfuric acid, oleum	748	1,199	Singapore 939; United States 152.
Talc, steatite, soapstone, pyrophyllite	10,733	6,115	People's Republic of China 4,283.
Other nonmetals, n.e.s.:			
Crude	1,054	1,078	Ireland 800; Japan 102; United States 99.
Oxides and hydroxides of magnesium, strontium and barium	384	973	United States 558; Finland 151; West Germany 117.
Bromine, iodine, fluorine	503	216	Japan 117; Singapore 37; People's Republic of China 33.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals, n.e.s	20,806	20,539	Singapore 6,724; Thailand 4,006; Australia 2,243.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	14,621	17,641	United States 6,248; Singapore 3,998; Japan 2,784.
Carbon black and gas carbon:			
Carbon black	8,236	9,263	Australia 5,063; Japan 1,761; United States 1,449.
Gas carbon	4	1,480	All from Singapore.
Coal, all grades, including briquets	111	424	United States 111; Japan 101; Australia 99.
Coke and semicoke	4,764	18,184	Japan 12,043; Taiwan 2,955; United Kingdom 1,520.
Gas, hydrocarbon, manufactured	55	74	France 70; Singapore 4.
Hydrogen and rare gases	113	179	Japan 133; United States 23; Australia 13.
Peat, including peat briquets and litter	9,611	57	All from United States.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	629	1,382	Singapore 1,272.
Refinery products:			
Gasoline, motor spirit do	87	33	Singapore 22.
Kerosine and white spirit do	1,133	3,002	Saudi Arabia 1,361; Kuwait 780; Singapore 644.
Distillate fuel oil do	991	445	Singapore 442.
Residual fuel oil do	4,541	5,704	Singapore 3,470; Saudi Arabia 1,200.
Lubricants (including grease)	179	355	Singapore 156; United States 101.
Other:			
Liquefied petroleum gas do	89	5	Singapore 4.

Table 3.—Indonesia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other—Continued			
Mineral jelly and wax thousand 42-gallon barrels	32	27	West Germany 8; People's Republic of China 6; Netherlands 5.
Nonlubricating oils, n.e.s do	147	129	United States 42; Japan 26; People's Republic of China 23.
Bitumen and other residues and bituminous mixtures, n.e.s. do	147	1,509	Singapore 1,353.
Pitch, pitch coke, petroleum coke do	53	6	Mainly from Singapore.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	3,605	1,990	Singapore 834; United Kingdom 474; Taiwan 278.

r Revised.

1 Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—P.N. Aneka Tambang operates the bauxite mines of Bintan Island near Singapore to furnish Japan with 53% Al_2O_3 bauxite on a long-term contract basis. However, because of economic difficulties, Japan cut the shipments from Indonesia from about 1.2 million tons to just under 1 million tons in 1975. Aneka Tambang was moving ahead on its plans to build a 500,000-ton-per-year alumina plant on Bintan Island to utilize a 50-year supply of off-grade local ores. A second proposed alumina plant under P.T. Alcoa Minerals Indonesia for West Kalimantan was shelved because of excessive costs and difficult worldwide economic conditions.

In July 1975, the Indonesian Government reached an agreement with a consortium of Japanese companies to produce 225,000 tons of aluminum and 450,000 tons of alumina yearly by the 1980's. The project site is Asahan in North Sumatra, with a 284,000-kilowatt powerplant at Segura-gura and a 320,000-kilowatt plant at Tangga. Three 75,000-ton aluminum potlines will be built at Kuala Tanjung on Sumatra's east coast. Development costs are projected at $465 million for the smelter, $260 million for the power system, and $87 million for infrastructure. The Indonesians feel that while the project might be only marginally profitable, it should be important in stimulating industrial development.

Copper.—Indonesia's primary copper production has come entirely from the Gunug Bijih copper mine in Irian Joya owned by Freeport Indonesia, Inc., which in turn is a 87% subsidiary of the U.S. firm Freeport Minerals Co. At yearend 1975, Freeport paid its first dividend of about $10 million and also made a prepayment of debt of about $12.4 million. Arrangements were made to sell 8.5% of the company's share to the Indonesian Government.

Production was down slightly, although still more than 200,000 tons of concentrates analyzing about 29% copper. Export earnings dropped from $125 million in 1974 to $74 million in 1975, reflecting mainly sharply lower copper prices. Because of reduced income and escalating costs, Freeport has been forced to reappraise its earlier plans to commence underground mining by 1980. The life of the existing open pit is only 5 to 7 years. Copper prices would have to improve considerably before underground mining is undertaken. So far, about two-thirds of the concentrates are exported to Japan, and the remainder to West Germany.

There was still significant interest in copper exploration. P.T. Tropic Endeavour is looking into the Gorontalo area of northern Sulawesi for porphyry copper.

Gold and Silver.—The State-owned Aneka Tambang produces about 12,000 troy ounces of gold and 141,000 to 247,000 troy ounces[5] annually from the Cikotok

[5] One kilogram equals 35.274 troy ounces.

mine in south Banten, West Java. High prices have helped prolong the life of this marginal mine. Unrecorded output from small private mines in Kalimantan and Sumatra might total well over twice Aneka Tambang's output. Freeport Indonesia's copper concentrate contains about 10 grams of gold and 135 grams of silver per ton, but this goes to Japanese and West German smelters. Because of good prices, many (mostly domestic) firms are exploring for gold in Sumatra, Kalimantan, and West Java.

Iron Sands.—Aneka Tambang produced just over 350,000 tons of iron sands in 1975 from the Cilacap area on the south coast of Central Java. These sands, analyzing 58% Fe and 10% TiO_2, are sold to Japanese pig iron manufacturers for blending in blast furnaces. Additional iron sands near Jogjakarta were being investigated by Aneka Tambang for the direct-reduction steelmaking process. Confirmed reserves at this second site amount to 230 million tons of 12.5% Fe sands in a 35-square-mile area. The Geological Survey of Indonesia is helping Aneka Tambang to systematically explore promising areas in the southern shores of Java and Bali. South Sulawesi Mining Corp. was investigating a nearby area with the help of Rio Tinto Bethlehem Indonesia. The State mining enterprise Aneka Tambang was drilling a large base-metal deposit in West Java, and has investigation underway in Sulawesi, Lampung, and West Kalimantan. Indonesian authorities still appeared receptive to foreign investment in base metals, including copper.

Manganese.—Demand was slack in 1975, especially in Japan. The small manganese mines in West and Central Java were unable to sell their full production. Explorations by P.D. Gama Karya have identified a 150,000-ton deposit on Pulau Doi. Indonesia has been producing only 13,000 to 18,000 tons per year of uneven-grade manganese ore in recent years.

Nickel.—Indonesia's nickel supply is totally export orientated. Ore has been the mainstay so far. Aneka Tambang operates the nickel mine at Pomalaa, southeast Sulawesi, Indonesia's only ore producer. Output declined slightly to about 800,000 tons of 2.4% Ni ore in 1975, but value increased because of higher nickel prices. Exports were about 726,000 tons, all to Japan. Japan started to contract for reduced tonnages of this lateritic, high-moisture (27%) ore for the years to come. Reserves at the present site may be adequate for only 15 years, although additional supplies might be available in nearby concessions. Aneka Tambang completed a 20,000-ton ferronickel smelter (4,500 tons contained nickel) in early 1976 to utilize the lower grade ore at Pomalaa.

P.T. International Nickel Indonesia (INCO) was getting its mine (cut-off grade of ore is 2.2% Ni) and nickel-matte plant (75% grade, with sulfur coming from Canada) at Soroko in South Sulawesi ready for first-stage operation by September 1976. Phase 1 capacity will be rated at 37 million pounds per year of contained nickel and phase 2, 107 million pounds per year by 1978. Second-stage construction began in 1975. At yearend 1975, there were about 6,500 construction and operating personnel, and the work force may increase 50% by 1977. A 165,000-kilowatt hydropower plant is being built at Larona to meet phase 2 objectives. The overall capital cost estimate has been revised upward to about $840 million. INCO is a 90% subsidiary of a Canadian parent company, but it has six Japanese partners to facilitate future sales.

P.T. Pacific Nikkel (United States Steel Corp. 48%, Hoogovens 24%, Newmont Mining Corp. 17%, and Sherritt Gordon Mines Ltd. 11%) has already spent $40 million on a project to produce metallic nickel from lateritic ores on Gag Island near the "bird's head" of Irian Jaya. Projected annual output is approximately 110 million pounds of nickel powder or briquets, 2 million pounds of nickel, and 1 million pounds of cobalt in mixed sulfide concentrate. This Sherritt-Gordon hydrometallurgical project may eventually cost about $900 million. The fate of this project may hinge upon a reassessment by Pacific Bechtel Corporation of capital and operating costs. If assessment is favorable, the World Bank may be involved in a loan to the extent of $50 million.

The Indonesian Nickel Development Co. (INDECO) has been working on nickel properties on Gebe Island near Halmakera. In September 1975, INDECO submitted a feasibility study to the Indonesian authorities indicating that its findings do not support a viable project under current economic conditions.

Steel.—The State enterprise Krakatau Steel has under construction at Cilegon in West Java an integrated mill based upon the HyL direct-reduction process and using Australian iron ore and natural gas from Central Java. First-phase production will be 1 million tons of sponge iron annually, one-half to be sold and the other one-half to be processed into billets, and then wire, bars, and shapes. The project is behind schedule, because of its connection with Pertamina, the oil giant. Lately, Kaiser Engineers and Armco Steel Corp. have been brought in to assist in the project. Steel requirements in Indonesia are steadily expanding, and this project is aimed at reducing imports.

Tin.—Indonesia maintained its position as the world's fourth ranking tin producer, and held 13.71% of the 1975 global export quota of ITC. As in 1974, production of tin-in-concentrates was just above 25,000 tons. However, pressure is building to expand production and increase Indonesia's quota. In addition to the big company, State-owned P.N. Timah, two private foreign companies started production and another foreign company delineated sizable reserves. P.T. Koba Tin, owned by an Australian company, produced 882 tons of tin in 1975 (689 tons in 1974) from gravel pump mines in Lubuk Besar (temporarily closed because of an ITC quota problem) and Nibung; Koba has ordered two 3-meter dredges.

P.T. Broken Hill Pty. Indonesia (BHPI), also a subsidiary of an Australian firm, has been exploring Billiton Island and produced small quantities of mine tin in 1975 on an experimental basis from the old Kelapa Kampit mine. BHPI is coming out with a report in August 1976 to define its findings and state its policy in the face of difficult-to-obtain ITC quotas. Billiton Exploraie Maatschappij Indonesia, B.V., subsidiary of Royal Dutch/Shell, has explored a contracted area offshore, between Bangka and Singkep Islands. Minable tin reserves so far are in the 15,000- to 20,000-ton range. A deep (45-meter) year-round, $25 million dredge, capable of processing 8 million cubic meters of gravel annually has been ordered. Production will begin in 1978, with eventual target of 2,500 tons of tin-in-concentrates per year. There is again a quota problem, but Billiton has offered one-fourth of its shares to P.N. Timah, and the proposal seemed to be well received.

P.N. Timah will always hold the controlling position, since it also owns the smelter. Its mine tin output in 1975 (1974 data in parentheses) was as follows, in tons: Bangka, 17,181 (17,659); Belitung, 5,209 (5,403); Singkep, 1,801 (1,776); and Bangkinang 200 (185). Timah has 12 fixed dredges on Bangka (one 18-cubic feet, five 14-cubic feet, and six 9-cubic feet) plus 8 small dredges that can be dismantled. On Belitung Island, there are 14 fixed dredges (five 14-cubic feet, eight 7-cubic feet, and one 5-cubic feet) plus 2 small dredges that can be dismantled. There are four dredges on Singkep Island—two 14-cubic feet, one 9-cubic feet, and one 5-cubic feet. Despite low tin prices in late 1975, Timah retained plans to acquire a seagoing dredge from the British firm Payne Co.; the dredge is rated at 50 meters in depth and has 24-cubic-foot buckets. This dredge will be in service by 1979. Overall, Timah has 15 to 20 years of reserves, according to present knowledge.

Timah's tin smelter, called Peltim, was finally expanded to 25,000 to 28,000 tons by adding conventional reverberatories to supplement the malfunctioning West German rotaries initially installed. Mackay Consultants successfully designed and helped build the new facilities. The plant is to smelt all of Indonesia's concentrates. Indonesia's tin metal production was brought up to nearly 18,000 tons in 1975.

Uranium.—Indonesian law reserves exploration for and exploitation of uranium to the national atomic energy authority Batan. Foreign participation is possible under special agreement. French firms have helped in uranium exploration in South and West Kalimantan; about 100 shallow holes were drilled in 1975 with deep drilling due to begin. West German firms were working in Lampung (Sumatra) and Central Sumatra, with plans to start drilling in 1976. Batan does not expect conclusive findings until a few years from now and hopes to start active mining in the mid-1980's. A Government nuclear-testing reactor is being built at Serpong, West Java.

NONMETALS

Cement.—Demand for cement in Indonesia has been several times production (roughly 1 million tons in 1975) during recent years. A vigorous program of expansion is now in progress with a goal to have 6.3 million tons of capacity by 1978–79, the end of the second 5-year plan. Two new plants were inaugurated in 1975—one each by P.T. Semen Cibinong (subsidiary of Kaiser Cement Co.) and Distinct Indonesia Cement Enterprise (this firm has Taiwan connections). Occupying adjoining sites in West Java, both plants will be rated at 500,000 tons per year initially, to be doubled in capacity in the next phase.

P.T. Semen Padang raised annual capacity of its Indarung plant to 330,000 tons during 1975, and P.T. Nusantara has a 500,000-ton facility under construction at Cilacap due onstream in June 1977. P.T. Semen Gresik is tripling capacity to 1.5 million tons. Baturaja, a Government joint venture with Padang and Gresik, plans to complete a 500,000-ton plant in South Sumatra by 1977–78. Plans in 1975 indicate that the Government of Indonesia will build a new 500,000-ton plant at Tonasa in South Sulawesi with a Canadian loan; the old plant is just over 100,000 tons. The Government is also expanding the Padang plant in West Sumatra by 500,000 tons with Danish financing. A private 500,000-ton cement plant is planned for Tjirebon in west-Central Java. In 1975, the existing cement plants produced about 1.4 million tons of limestone and 0.25 million tons of clays for cement manufacture.

Clays.—The tin company Timah has been exploring kaolin deposits on Bangka and Billiton Islands in 1975, as part of a program to diversify. Many clays found are intermediate in quality, between paper- and ceramic-grade and superior to filler-grade. Timah hopes also to interest the Japanese market in this regard. Use of indigenous clays for building materials was also being investigated. Timah also tested smelter slags for making mineral wool for the domestic construction industry.

Elsewhere, the cement industry produced about 250,000 tons of clays in 1975 for its own use in cement manufacture. Other small firms also produced approximately 25,000 tons of kaolin during the year.

Fertilizer Materials.—Indonesia was working on a 100% fertilizer self-supply structure by effectively utilizing its natural gas resources. Long a net importer of fertilizers (including nearly 2 million tons of urea in 1974), Indonesia is likely to become an exporter after 1977. Demand by 1978 is estimated at 2 million tons of urea, 580,000 tons of triple super phosphate (TSP), 200,000 tons of ammonium sulfate, and 160,000 tons of NP/NPK (compound fertilizers).[6] At yearend 1975, a 175,000-ton-per-year urea plant and another 46,000-ton-per-year urea plant were in operation in Palembang, and a 21,000 ton-per-year urea plant was working in Gresik.

Indonesia plans to complete the following fertilizer plants (shown with annual capacity) by yearend 1978: A 150,000-ton-per-year ammonium sulfate plant, a 570,000-ton-per-year urea plant, and a 400,000-ton-per-year TSP plant at the Petrokimia factory; 570,000-ton-per-year urea plants at the Pusri third factory, the Pusri fourth factory, and the Pupuk Jujang plant; two additional 262,000-ton-per-year urea plants at Palembang plus a 154,000-ton-per-year diammonium phosphate (DAP) plant; a 152,000-ton-per-year TSP plant and a 38,000-ton-per-year TSP plant at Gresik; 258,000 ton-per-year urea plants at Balikpapan and Tjirebon; and a 138,000-ton-per-year TSP plant in Tjilajap. Many of these projects are related to the rapidly expanding petrochemical industry of Indonesia.

Stone.—*Granite.*—P. T. Karimum Granite, a new 50-50 joint venture between Bovis Hong Kong and the Indonesian firm P.T. Indophing, operates Indonesia's only granite quarry on Karimum Island in the Ria Group just off Singapore and markets crushed rock. Most output was purchased by the State oil enterprise Pertamina for use in the construction of LNG facilities in Aceh and East Kalimantan. Remaining production goes to Singapore, which is asking for more of the future supply, because of special financial connections. The long-term target is to produce 2.9 million tons per year, about 4.5 times the 1975 level and nearly 7 times the 1974 level.

MINERAL FUELS

Coal.—Indonesia is about to launch its coal program, and recent output has no bearing on future possibilities.[7] P.N. Batubara, the State coal company, operates

[6] Japan Chemical Week (Tokyo). July 1, 1976, p. 10.

[7] Simandjuntak, M. Coal Resources and Potentials in Indonesia. Jakarta, 1974, 104 pp.

the Bukit Asam open pit mine near Palembang in south Sumatra, which produced about 130,000 tons in 1975 and the Ombilin underground mine near Padang in west Sumatra, which produced approximately 76,000 tons in 1975. Both coals are medium-grade subbituminous to bituminous varieties (mostly 6,000 to 7,500 kilocalories) suitable for general use and metallurgical blending. Bukit Asam may have 90 million tons of reserves, and Ombilin, 100 million (plus possibly another 100 million at an adjacent site). A crash program was in progress in 1975 to raise Bukit Asam's output to 2 million tons annually a decade from now at a cost of $63 million, and to raise Ombilin's output to 650,000 tons by the mid-1980's at a very tentative cost of $35 million. The World Bank may assist in the Bukit Asam project. Bukit Asam's future markets will include the Batu Raja cement plant to be built, additional industries in Palembang, the Peltim (or Muntok) tin smelter, and power projects at mine mouth Lampung Province, and Cilincing on West Java's north coast. Planning was less advanced at Ombilin, which will supply P.T. Semen Padang's Indarung cement plant, among other facilities.

In 1975, extensive coal resources were announced by Shell Mijnbouw N.V. (Shell International) in the Lampung Province of south Sumatra, about 215 kilometers inland from the coast.[8] Reserves in a 7-million-hectare area were reported to run as high as 3.5 billion tons of subbituminous to bituminous coal. Shell's reconnaissance drilling program ends June 1, 1976, at which time three-quarters of the contracted area will be relinquished. The production-sharing contract has been signed with Batubara. Shell plans to invest about $1.2 billion, including $900 million for production and $300 million for marketing and shipping. The tentative target will be to produce 25 million tons of coal annually along with removal of 75 million tons of overburden. Output would come from various operations, and the eventual overall production level would be related to export demand, mainly from Japan. Neither of the existing railroads in the coal area can accommodate greatly expanded production, and the nearest usable port, Telukbetung at Sumatra's southern tip, is good only for boats of less than 12-foot draft.

Petroleum and Gas.—Indonesia's oil production, which ranged twelfth in the world in 1975, was down slightly from 1,392,000 barrels per day (barrels per day multiplied by 50 will give the approximate equivalent of metric tons per year) in 1974 to 1,313,000 barrels in 1975. The bulk of this was exported as crude oil, which explains why Indonesia's refinery capacity is not particularly large. Oil exports netted $5.3 billion in 1975 and $5.2 billion in 1974, compared with $1.6 billion in 1973 when prices were still low. P.T. Caltex Pacific Indonesia's 1975 output was 831,000 barrels per day, which represented more than 63% of the national total. Caltex produces low-sulfur Minas light crude.

Pertamina accumulated massive debts of at least ten, if not "several tens" of billion dollars, through overspending monies to be earned in the future and despite very favorable high prices. Actually, Pertamina had completely overextended its financial lines in the face of the world recession. This forced subsequent reorganization and removal of its president during the year. Pertamina had been in many lines of business, including fertilizers, petrochemicals, LNG, steel, and even tourism. Its influence is still great, and it is the Government entity representing Indonesia in contractual arrangements. The original contract-of-work and production-sharing contracts have been greatly modified to accommodate the sharp price increases to over $12 per barrel. In 1974, revenue above $5 per barrel was shared 85% for the Government and 15% for the companies with contract-of-work arrangements.

The tight budget situation in 1975 led the Government to review the Caltex account once more. Meanwhile, Caltex's profit from a $12.60-per-barrel price was only $2.30 or about $600 million to $700 million profit in 1975, after additional cuts in selling to the domestic market. In early 1976, Pertamina was talking about $1.00 per barrel extra for Caltex and the others.

Indonesia's potential is shown by the discoveries reported.[9] In the Sangatta Field

[8] U.S. Embassy, Jakarta, Indonesia. Production-Sharing Agreement to Govern Development of Sumatra Coal. State Department Airgram A-145, Oct. 17, 1975, 3 pp.

[9] Mining Journal (London). Mining Annual Review 1976. June 1976, Pp. 403-405.

of Kalimantan, Asian Drilling Co. of Japan hit 14 oil wells and 1 gas well out of 17 holes drilled, and their combined yield may reach 15,000 barrels per day. In the Sanga-Sanga Field of Kalimantan, Tesoro discovered oil in well PT 872 and Union Oil Indonesia found oil in a fault block. Union Oil was producing 114,000 barrels per day at yearend 1970. Petromer Trend Corporation discovered a fifth well in Irian Jaya and now produces 70,000 barrels per day. Phillips Petroleum Co. Indonesia hit a third producing well on Sulawati Island in the Berau Lake area of Irian Jaya. In Sumatra, California Asiatic Oil Co. hit an eighth well in the Coastal Plains 80 kilometers southeast of the Minas Field. The Natomas Co. successfully delineated the Rama Field in its offshore southeast Sumatra contract area. Natomas already has two wells of 20,000 barrels per day, one of 8,000 barrels per day, and a gasfield of 7 million cubic feet per day.

Pertamina reported a new gas and condensate deposit in the Tapa Project in the northern part of East Kalimantan, 15 kilometers from the old field on Bunyu Island. Japex Indonesia, Ltd., and partner Total Indonesie had been producing 40,000 barrels per day from seven wells 80 kilometers northeast of Balikpapan in East Kalimantan. Another large oilfield called Handil, in the Mahakam River delta in Kalimantan, also had been recently discovered, and was expected to produce 150,000 barrels per day by 1977.

Principal oil producers in Indonesia are listed below with their estimated production capacities at the end of 1975, in barrels per day: P.T. Caltex, 856,000; P.T. Stanvac Indonesia, 36,000; Pertamina, 85,000; ARCO, 102,000; Union Oil, 76,000; Independent Indonesian American Petroleum Co. (IIAPCO), 74,000; Petromer Trend, 66,000; Total Indonesie, 60,000; and Japex, 53,000.

Hitherto, Indonesia's main oil-export markets have been Japan and the United States, but the Mining Minister has announced that the markets will be expanded to include Australia, Europe, and other members of the Association of South East Asian Nations (Malaysia, Philippines, Singapore, and Thailand). At the same time, however, exports to Japan (which have not been affected by the People's Republic of China's increased oil exports) are to be expanded, and a new contract for the supply of low-sulfur fuel oil to the United States has been agreed between Pertamina and Southern California Edison Co. This contract covers 1976 to 1985.

An important development to insure stable oil supplies to Asian countries is the proposal to build a transshipment station with a capacity of about 3.6 million barrels at Indonesia's Lombok Island. Japan, Indonesia, and Saudi Arabia have established an international consortium, capitalized at $30 million to promote the project, and the participation of other nations is being encouraged.

The Mining Minister has issued a license to Dresser AG and P.T. Rockbit Indonesia to establish a plant to produce drilling equipment on Batam Island. The proposal includes the production of drilling equipment, both for the oil industry and for the mining industries.

Natural gas from various places will be more fully utilized to produce fertilizers. Estimated gas reserves total 34.7 trillion (million-million) cubic feet.[10] The two major offshore areas of the early 1970's—Mobil Oil Indonesia Inc.'s Arunfield off northern Sumatra, and Huffco's Badak oilfield off East Kalimantan are expected to be capable of furnishing over 14 million tons of LNG for export. The onshore fields at Palembang are also expected to provide LNG shipments of 1 million tons eventually. Japan has a contract to obtain 7.5 million tons of LNG beginning March 1977. Pertamina recently asked for $372 million of overruns from Japan as a loan, which Japan has agreed to provide.

[10] The Petroleum Economist (London). July 1975, pp. 247.

The Mineral Industry of Iran

By Bernadette Michalski [1]

While a variety of minerals and metals are mined and processed in Iran, it is the revenues from the production and export of hydrocarbons that make the substantial contribution to the Iranian economy and provide most of the financial basis for industrial diversification.

Encouraged by the fourfold increase in hydrocarbon revenues, the Government expanded its industrial investment program. This economic activity was reflected in the rapid increase of the Iranian gross national product (GNP) which grew by 34% in the Iranian year 1352 (March 1973 to March 1974) and by 42% in 1353 (March 1974 to March 1975). The growth rate for the Iranian year 1354 (March 1975 to March 1976) was reported to be only 6.5%, reflecting Iran's economic slow down in the face of reduced oil revenues.

A worldwide economic recession followed the fourfold price increases of late 1973 and resulted in a reduced demand for petroleum. Iranian petroleum revenues fell an estimated 5% while petroleum production itself declined by more than 11%. Price increases in the fourth quarter of 1975 accounted for the differences in value and production declines.

By mid-1975 credit expansion and money supply growth had peaked and Iranian budget plans were being revised as the Government reassessed priorities. At yearend the Government, while reaffirming its commitment to industrial development, proclaimed that the Iranian Fifth National Development Plan which was to cover the period from March 1973 to March 1978, was to be extended by 1.5 years.

PRODUCTION

Although petroleum and gas operations dominated Iran's mineral industry activities, the country produced a variety of minerals as indicated in table 1. Aluminum production is based on the reduction of imported alumina; however, other primary metal production was derived from indigenous ores in 1975.

Iranian crude petroleum production was reduced by more than 11% compared with 1974 production levels. Production declines are attributed to a lowered demand in face of increased petroleum prices. Petroleum production for 1975 averaged over 5 million barrels per day, approximately 1.5 million barrels per day below installed capacity levels. The posted price of Iranian crude oil was $11.47 per barrel for 34° API gravity crude and $11.24 for 31° API gravity crude in the first three quarters of 1975. On October 1, 1975, the posted price was increased to $12.50 and $12.36 per barrel, respectively. Iranian crude production averaged 5.5 million barrels per day in the first three quarters of 1975. Production averaged 4.8 million barrels per day in the last quarter, indicating an even greater reduction in demand once the additional price increase took effect.

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

Table 1.—Iran: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973 [2]	1974 [2]	1975 p [2]
METALS			
Aluminum, primary ingot	33,700	49,000	51,000
Chromium, chromite, gross weight	140,000	175,000	175,000
Copper:			
Mine output, metal content	3,000	1,800	2,400
Smelter	2,000	6,500	6,000
Refined e	7,000	7,000	7,000
Iron and steel:			
Iron ore, gross weight ... thousand tons	850	1,000	1,000
Pig iron ... do	400	1,500	1,000
Steel, crude ... do	200	400	600
Lead:			
Mine output, metal content	r 37,500	47,500	53,000
Smelter output	(3)	e 300	e 300
Manganese ore, gross weight	22,000	30,000	36,000
Zinc, mine output, metal content	r 71,500	82,500	66,000
NONMETALS			
Barite	95,000	e 95,000	e 95,000
Cement, hydraulic ... thousand tons	3,489	5,000	5,500
Clays:			
Bentonite	35,000	50,000	50,000
Fire clay	31,000	NA	NA
Kaolin e	75,000	100,000	100,000
Fertilizer materials, manufactured, gross weight	e 436,000	e 450,000	NA
Gem stones, turquoise, crude e	70	70	70
Gypsum ... thousand tons	3,000	4,000	5,400
Lime e ... do	1,000	1,000	1,000
Magnesite e	16,000	16,000	16,000
Pigments, mineral, natural	r 5,000	6,000	6,000
Salt, rock ... thousand tons	350	400	400
Stone, sand and gravel:			
Limestone ... do	r 120	150	200
Marble ... do	18	25	25
Silica ... do	r 249	274	300
Travertine ... do	r 190	200	215
Strontium minerals, celestite e	300	300	300
Sulfates, natural:			
Aluminum-potassium sulfate (alum)	e 300	NA	NA
Sodium sulfate (mineral not specified)	18,000	25,000	25,000
Sulfur:			
From ores (refined) ... thousand tons	21	e 20	e 20
Elemental, byproduct ... do	595	605	487
Total ... do	616	e 625	e 507
MINERAL FUELS AND RELATED MATERIALS			
Coal ... do	r 1,050	1,200	1,000
Coke e ... do	400	400	400
Gas, natural:			
Gross production ... million cubic feet	1,698,691	1,766,721	1,603,384
Marketed production ... do	701,678	787,360	771,057
Natural gas liquids:			
Propane ... thousand 42-gallon barrels	5,256	12,760	e 19,000
Butane ... do	5,000		
Natural gasoline and other ... do	5,132	4,465	
Total ... do	15,388	17,225	e 19,000
Petroleum:			
Crude (net) [4] ... do	r 2,139,229	2,197,901	1,952,650
Refinery products:			
Gasoline:			
Aviation ... do	5,217	4,908	4,123
Motor ... do	21,748	23,458	26,389
Jet fuel ... do	13,157	12,541	12,520
Kerosine ... do	20,506	22,051	27,003
Distillate fuel oil ... do	38,986	41,175	44,885
Residual fuel oil ... do	88,224	97,901	101,243
Lubricants ... do	1,077	601	2,495
Other:			
Liquefied petroleum gas ... do	2,299	2,621	3,661
Naphtha and solvents ... do	3,026	5,877	8,485
Asphalt ... do	3,159	3,752	4,523
Unspecified ... do	3,020	2,313	1,048
Refinery fuel and losses ... do	13,840	12,811	11,201
Total ... do	214,259	230,009	247,576

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, 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 are for years beginning March 21 of year stated, except for natural gas, natural gas liquids and petroleum, which are for regular calendar years.

[3] Revised to none.

[4] Excludes petroleum produced and reinjected into fields.

TRADE

Trade activity financed by the influx of petroleum revenues in 1974 had placed heavy burdens upon Iran's limited port facilities. Iranian ports have a nominal annual handling capacity of 4 million tons. During calendar year 1975, nearly 10 million tons of cargo was unloaded in Iranian ports. Delays of as much as 120 days were reported by vessels awaiting berths for unloading. Berthing delays were compounded by further delays resulting from overburdened distribution systems. As a result, the timetable for many development projects had been disrupted.

While Iran enjoyed a balance of payment surplus of $8 billion in Iranian year 1353 (March 1974 to March 1975), reduced petroleum exports combined with expanded imports dwindled the balance of payment position to a $700 million deficit by Iranian year 1354 (March 1975 to March 1976). Petroleum crude and product exports accounted for 96% of all receipts. In calendar year 1975 crude oil exports averaged 4.67 million barrels per day and petroleum product exports averaged 0.27 million barrels per day, considerably below respective export levels of 5.37 million and 0.31 million in calendar year 1974.

Table 2.—Iran: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal including alloys, all forms	r 20,520	18,237	Japan 5,320; People's Republic of China 4,992.
Arsenic, natural sulfides	r 12	18	Syria 10; Iraq 7.
Chromium, chromite, 48% Cr_2O_3	150,811	149,400	Japan 37,400; Poland 15,000; Czechoslovakia 12,000.
Copper:			
Ore and concentrate	r 1,100	--	
Metal including alloys	4	3	United Arab Emirates 2.
Iron and steel:			
Iron ore and concentrate	1,400	--	
Metal:			
Scrap	101	166	Japan 149; Afghanistan 17.
Pig iron, ferroalloys and similar materials	99	10,719	Japan 8,111; Pakistan 2,500.
Semimanufactures	r 2,248	1,280	Kuwait 1,018; Abu Dhabi 143.
Lead:			
Ore and concentrate	88,764	45,813	Mainly to U.S.S.R.
Oxides	--	(2)	All to Afghanistan.
Metal including alloys, all forms	627	921	Belgium 750; Italy 100.
Nickel metal including alloys:			
Scrap	--	10	All to Netherlands.
Unwrought	--	1	All to United Arab Emirates.
Silver waste and sweepings troy ounces	17,201	5,787	All to Libya.
Zinc:			
Ore and concentrate	72,355	70,483	U.S.S.R. 24,655; Japan 14,310; Belgium 9,623.
Oxide	100	--	
Metal including alloys, all forms	20	112	All to Iraq.
Other:			
Ore and concentrate, n.e.s.	r 4	--	
Metals including alloys, all forms	1	(2)	All to Sri Lanka.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
NONMETALS			
Abrasives, natural:			
Crude, n.e.s.	r 224	363	All to United Arab Emirates.
Dust and powder of precious and semiprecious stones, except diamond	(2)	--	
Grinding and polishing wheels and stones	r 14	27	Hong Kong 23; Saudi Arabia 2.
Barite	1,444	--	
Boric oxide and acid	--	39	All to Italy.
Bromine and iodine	20	--	
Cement	6,500	2,093	Mainly to Saudi Arabia.
Chalk	21	27	All to Afghanistan.
Clays and clay products:			
Crude clays, n.e.s.:			
Fuller's earth	8	12	Oman 4; Bahrain 4; Kuwait 4.
Fire clay	--	10	All to Syria.
Drilling mud	1,300	1,500	All to Saudi Arabia.
Other	3,999	6,692	Kuwait 5,038; Qatar 500; Abu Dhabi 500.
Products:			
Refractory	291	8	Kuwait 4.
Nonrefractory	r 5,013	1,448	U.S.S.R. 1,221; Kuwait 164.
Diamond ... value	--	$34,821	All to United States.
Diatomite	2	--	
Fertilizer materials, manufactured:			
Nitrogenous	6	(2)	All to Oman.
Phosphatic	r 16	18	All to Kuwait.
Potassic	18	35	Do.
Other	238	1,933	Kuwait 1,355; Oman 520.
Ammonia	96,005	135,001	France 90,000; United Kingdom 40,000.
Graphite, natural	--	2	Mainly to West Germany.
Gypsum	r 4,197	1,477	Kuwait 600; Saudi Arabia 500; Oman 317.
Lime	(2)	--	
Magnesite, crude	(2)	--	
Mica	1	--	
Pigments, natural, mineral including processed iron oxides	r 1,864	2,876	France 2,000; India 825.
Precious and semiprecious stones, except diamond ... value	$616,474	$769,214	Mainly to United States.
Pyrite	22	--	
Salt	2,513	2,059	Kuwait 619; United Arab Emirates 438; Oman 339.
Stone, sand and gravel:			
Dimension:			
Crude and partly worked:			
Calcareous	250	60,813	Japan 19,769; Italy 16,562.
Slate	45,513	--	
Other	67	140	All to United Arab Emirates.
Worked:			
Slate	r 290	992	Kuwait 400; West Germany 324.
Paving and flagstone	16	972	Oman 876.
Other	r 4,119	2,660	Kuwait 800.
Dolomite	75	297	All to Kuwait.
Gravel and crushed stone	47,788	52,889	Kuwait 35,383; Oman 8,060; West Germany 7,220.
Limestone (except dimension)	--	151	Mainly to Kuwait.
Sand, excluding metal bearing	--	2	All to West Germany.
Sulfur:			
Elemental:			
Colloidal	284,631	211,144	India 123,743; Mozambique 50,000.
Other than colloidal	121,244	60,807	India 50,000; Switzerland 5,791.
Sulfuric acid	41,400	15	All to Oman.
Other:			
Crude nonmetals, n.e.s	r 2,836	7,290	U.S.S.R. 5,000; Japan 2,200.
Slag, dross, and similar waste, not metal bearing	880	12	Mainly to United Arab Emirates.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	--	[3] 1,707	All to Asia.
Carbon black, gas carbon	--	1	Mainly to Japan.
Coal, all grades including briquets	325	648	All to Kuwait.
Petroleum: [3]			
Crude and partly refined thousand 42-gallon barrels	2,008,971	1,562,536	Europe 727,512; Asia 500,930.
Refinery products:			
Gasoline do	18,925	59,976	Europe 24,228; Asia 22,413.
Kerosine do	r 11,420	13,477	Africa 5,063; Asia 4,192.
Distillate fuel oil do	56,881	66,271	Europe 27,009; Asia 21,379; America 10,276.
Residual fuel oil do	38,267	29,316	Europe 16,224; Asia 6,143.
Lubricants do	6	13	Mainly to Asia.
Other:			
Liquefied petroleum gas do	8,369	8,614	Asia 8,392.
Mineral jelly and wax do	(2)	(2)	All to Asia.
Bitumen and other residues do	(2)	2	Do.
Bituminous mixtures do	--	3	Do.
Total do	r 133,368	177,672	

r Revised.
[1] Data are for Iranian calendar years beginning March 21 of the year indicated.
[2] Less than ½ unit.
[3] Destinations of shipments reported by continent only, in most cases; detail by country not available except as shown.

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

Commodity	1973	1974
METALS		
Aluminum:		
Bauxite ore and concentrate	--	6
Oxide and hydroxide	r 55,091	90,456
Metal including alloys:		
Scrap	5	15
Unwrought	r 340	711
Semimanufactures	r 9,977	13,299
Arsenic, trioxide, pentoxide, acids	112	90
Beryllium metal including alloys, all forms	1	4
Chromium oxide and hydroxide	132	68
Cobalt oxide and hydroxide	543	21
Copper metal including alloys:		
Scrap	r 418	1,528
Unwrought	r 371	345
Semimanufactures	r 18,322	20,670
Columbium and tantalum metal including alloys, all forms	2	--
Gold metal, all forms thousand troy ounces	17	142
Iron and steel:		
Ore and concentrate	--	520
Metal:		
Scrap	15,084	6,129
Cast iron	r 15,317	17,193
Ferroalloys	22,090	7,726
Steel primary forms	r 253,322	208,192
Semimanufactures thousand tons	r 1,714	2,209
Lead:		
Oxide	r 150	120
Metal including alloys:		
Scrap	1,101	21
Unwrought	2,682	6,016
Semimanufactures	1,345	168
Magnesium metal including alloys, all forms	r 156	59
Manganese:		
Ore and concentrate	20	615
Oxide	1,888	2,415
Mercury 76-pound flasks	661	472
Molybdenum metal including alloys, all forms	1	4
Nickel metal including alloys:		
Scrap	5	--
Unwrought	r 56	63
Semimanufactures	r 249	439
Platinum metal including scrap, waste and ash -- value, thousands	$56	$273
Silver metal including scrap, waste and ash -- thousand troy ounces	875	1,031
Tin:		
Oxide	16	5
Metal including alloys:		
Scrap	6	(2)
Unwrought	554	453
Semimanufactures	203	260
Titanium oxide	1,369	1,657
Tungsten metal including alloys, all forms	r 39	8
Uranium and thorium metal including alloys, all forms -- kilograms	--	56
Zinc:		
Oxides	r 984	1,894
Metal including alloys:		
Scrap	129	27
Unwrought	6,822	2,295
Semimanufactures	r 379	1,718
Other:		
Ore and concentrate:		
Of molybdenum, tantalum, titanium, vanadium, zirconium	r 1,213	785
Of base metals, n.e.s	600	1
Ash and residue containing nonferrous metals	r 286	50
Metals including alloys, all forms:		
Alkali, akaline earth, rare earth metals	416	190
Base metals, including alloys, all forms, n.e.s	2,258	672
NONMETALS		
Abrasives, natural:		
Crude, n.e.s	r 741	291
Dust and powder of precious and semiprecious stones, except diamond	(2)	(2)
Grinding and polishing wheels and stones	r 1,230	1,411
Asbestos	15,462	26,058
Barite	23	18
Boron materials:		
Crude natural borates	64	--
Oxide and acid	23	54

See footnotes at end of table.

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

Commodity	1973	1974
NONMETALS—Continued		
Cement	[r] 302,725	738,337
Chalk	1,422	2,610
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s.:		
Fire clay	8,717	6,067
Fuller's earth	--	1
Kaolin	13,194	17,034
Drilling mud	18,833	13,159
Kyanite and sillimanite	1,892	1,211
Products:		
Refractory, (including nonclay bricks)	[r] 47,186	62,308
Nonrefractory	[r] 4,925	3,112
Cryolite and chiolite	2,172	1,034
Diamond, all grades ... value	$17,181	$320,795
Diatomite and other infusorial earth	[r] 912	889
Feldspar and fluorspar	2,806	641
Fertilizer materials:		
Crude:		
Phosphatic	141,356	212,186
Other	156	2,196
Manufactured:		
Nitrogenous	39,404	130,196
Phosphatic including Thomas slag	232,525	47,082
Potassic	51	8,945
Other including mixed	89	4,036
Ammonia	75	62
Graphite, natural	1,901	1,847
Gypsum and plasters	[r] 1,026	983
Iodine and bromine	135	288
Lime	[r] 159	1,489
Magnesite	[r] 16,369	1,898
Mica:		
Crude	1,819	1,612
Worked	13	12
Pigments, mineral:		
Natural, crude	[r] 10	9
Iron oxides, processed	[r] 928	738
Precious and semiprecious stones, except diamond:		
Natural ... value	$66,545	$422,848
Manufactured ... do	$45,222	$198,314
Salt	[r] 40	51
Sodium and potassium compounds, n.e.s.:		
Caustic soda	5,770	523
Caustic potash	160	21
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked:		
Slate	(3)	7
Other	6	--
Worked:		
Slate	[r] 3	(3)
Other	[r] 24	106
Dolomite	30	136
Gravel and crushed stone	658	1,669
Limestone (except dimension)	678	74
Quartz and quartzite	1,212	1,228
Sand, excluding metal bearing	12,042	10,130
Sulfur:		
Elemental, all forms	[r] 960	571
Sulfuric acid	[r] 86	8,585
Sulfur dioxide	5,255	17
Talc, steatite, soapstone, pyrophyllite	338	584
Other nonmetals, n.e.s.:		
Crude	[r] 2,019	171
Slag, dross, and similar waste, not metal bearing	51	103
Oxides and hydroxides of magnesium, strontium, and barium	613	808
Fluorine, elemental	2	--
Other	754	446
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	2,020	123
Carbon black and gas carbon	[r] 5,816	8,992
Coal and coke including briquets	[r] 61,516	24,501
Hydrogen and other rare gases	[r] 510	321
Peat including peat litter	37	40

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974
MINERAL FUELS AND RELATED MATERIALS—Continued		
Petroleum:		
Crude and partly refined ---- 42-gallon barrels --	1,152,	1,656
Refinery products:		
Gasoline ---- do ----	r 2	--
Distillate fuel oil ---- do ----	r 186	239
Kerosine and jet fuel ---- do ----	--	(2)
Residual fuel oil ---- do ----	(2)	--
Lubricants ---- do ----	r 117,486	70,593
Mineral jelly and wax ---- do ----	r 18,446	33,052
Other:		
Nonlubricating oils, n.e.s ---- do ----	11,732	14,749
Liquefied petroleum gas ---- do ----	r 543	217
Pitch ---- do ----	21,777	21,843
Pitch coke ---- do ----	22,218	25,074
Petroleum coke ---- do ----	11	1,430
Bitumen and other residues ---- do ----	5,557	10,569
Bituminous mixtures ---- do ----	1,757	5,218
Total ----	r 199,715	182,484
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ----	r 281	30,289

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.—Iran's total primary aluminum output, was produced at the Arak smelter owned by the Iranian Aluminum Co. (Iralco). The Industrial Development and Renovation Organization, an Iranian State agency, holds 82.5% interest in Iralco, Reynolds International Inc. (United States) holds 12.5% interest, and the Pakistan Government holds the remaining 5% interest. The Arak smelter is slated for expansion to a 120,000-ton-per-year capacity. The date for completion of the Arak smelter expansion, originally scheduled for 1976, was revised to early 1979. The construction of a second aluminum smelter is under study. The proposed initial capacity for the second smelter is 150,000 tons.

Alumina imported from Australia has been the traditional feedstock for the production of primary aluminum in Iran; however, preliminary discussions indicate that India and/or Guinea will be the feedstock supply source for the second smelter and possibly for the additional capacity installed at Arak also.

Approximately half of the aluminum ingot production is exported, with Japan as the principal destination.

Chromite.—Three chromite deposits are believed to be currently under exploitation: Cheshmeh Bid, Khajeh Jamali, and Neyriz. During 1975, Iran reported exports of 85,000 tons of chromite averaging 48% Cr_2O_3.

Copper.—Development work continued on the Sar Cheshmeh porphyry copper deposit. While 40 million tons of overburden was scheduled for removal by 1976, followed by mine operations commencing in March of 1977, only 10 million tons of overburden had actually been removed by yearend 1975, delaying mining operations until 1978. Construction and installation activities on the copper flotation and smelting units were reportedly 15% completed by yearend 1975. When all units are operational, the Sar Cheshmeh deposit should yield 145,000 tons of copper metal annually.

Initial production from the Qaleh Zari copper mine and concentrator was announced in 1975. At full capacity the mine and concentrator should yield annually 20,000 tons of concentrate containing 25% Cu.

Iron Ore.—The Bafg deposit in Central Iran supplied about a million tons of iron ore for use in the Aryamehr iron and steel complex in 1975. Development of Iran's second major iron ore deposit, Gol-e Gowar, was under way. Mine production is anticipated in 1978 at an annual rate of 5 million tons of ore yielding 3 million tons of concentrate suitable for direct reduction.

India will be an additional source of iron ore as ore extraction is realized from the Kudremukh deposit which is being developed with Iranian financing. Initial mine production at Kudremukh is scheduled for 1978. Full production capacity, 20 million tons per year, should be reached by 1980. Kudremukh ore averages 35% to 39% Fe content. It is to be concentrated at the mine site to 66% Fe content. The concentrate will be hydraulically transported 38 miles to the expanded port of Mangalore, India for shipment to the Port of Bandar Shahpur, Iran. From this point, it will be shipped by rail to Ahwaz, where the concentrate will be pelletized at a 5-million-ton-per-year capacity plant designed by Lurgi-Chemie und Hüttentechnick GmbH (West Germany). The pellets will be the feedstock for the direct reduction plants at the Ahwaz steel complex.

Iron and Steel.—Iran's total crude steel output was produced at the Aryamehr iron and steel complex at Isfahan. Production capacity of the complex is 750,000 tons per year. Expansion to an 8-million-ton-per-year capacity is scheduled for 1986. With the exception of the slated expansion of Aryamehr, future Iranian steel capacity growth will be based on sponge iron produced by the direct reduction of iron ore. Iron and steel complexes using direct reduction methods are under construction or proposed at Ahwaz, Bandar Abbas, Bushire-Kangan, and Isfahan. By 1980, Iran anticipates annual crude steel capacity based on direct reduction processes to be 9 million tons. During 1975, three sponge iron gas reduction plants were under construction at Ahwaz under contracts to the West German firms of Korf Industrie und Handel GmbH und Co., and Thyssen, and the American firm of Swindell-Dressler. A portion of the sponge iron from these plants will supply the 1-million-ton-per-year capacity electric furnace plant, designed by Swindell-Dressler, and now under construction. The Khuzistan Metal Industries Co. and the Ahwaz Rolling Mills Co. will process the remaining Ahwaz sponge iron output.

Lead and Zinc.—At least 15 mining companies were involved in the extraction and beneficiation of lead and zinc ores and concentrates, a raw material destined for Iran's export markets. Iran's industrial goals, however, include the development of a domestic lead and zinc smelting industry by 1980. Construction of a 70,000-ton-per-year capacity zinc smelter and a 20,000-ton-per-year capacity lead smelter was under consideration.

The largest company involved in the mining of lead and zinc ores in Iran is Société Industrielle et Minière de l'Iran (SIMIRAN). Two major deposits owned by SIMIRAN are at Angouran and Khursk. Concentrating facilities at both mines were under expansion in 1975. Initial expansion plans at Angouran included construction of a 1,000-ton-per-day capacity flotation plant in 1975; however, that capacity will be doubled with completion of facilities for a heavy media preconcentration stage. When concentrator facilities are in full operation in 1978, Angouran output will be 180,000 tons of zinc concentrate and 60,000 tons of lead concentrate annually. Expansion activities at the SIMIRAN Khursk concentrator will result in raising the concentrator's capacity to 700 tons of ore per day by 1979, doubling its present capacity level.

Molybdenum.—The Sar Cheshmeh prophyry copper deposit contains varying amounts of molybdenum. The Parsons-Jurdan Co. (United States) has contracted to build a molybdenum extraction plant within the Sar Cheshmeh complex. Plant capacity is to be 12 tons of molybdenum per day. No startup date for the plant has been announced. Considering the projected growth of Iran's steel output with its parallel demand for molybdenum, it may be assumed that every effort will be made to have the molybdenum extraction plant operational when ore extraction commences at Sar Cheshmeh (now anticipated early in 1978).

NONMETALS

Cement.—Iran's active building programs have placed heavy demands on the nation's cement manufacturing industries. Existing plants are undergoing expansion programs and 10 new cement plants were in various stages of planning and construction to raise cement output from its 1975 level of 5.5 million tons to 18 million tons by 1980.

Fertilizer Materials.—Much of Iran's chemical fertilizer needs are satisfied by products of the chemical complexes at Shahpur and Shiraz operated by the National Petrochemical Co. of Iran (NPCI). Both complexes are undergoing expansion. By 1978 ammonia production capacity at Shiraz is scheduled to be 400,000 tons per year, urea production 500,000 tons per year, and ammonium nitrates production at 220,000 tons per year. By 1977, annual capacity at the Shahpur chemical complex is scheduled to be 200,000 tons of ammonia and 730,000 tons of urea. The NPCI has proposed construction of a nitrogen fertilizer complex at Neka. The proposed annual capacity of the complex is 500,000 tons of ammonia and 525,000 tons of urea. Feedstock for the complex will be natural gas from the Khangiran deposit near Sarakhs.

MINERAL FUELS

Carbon Black.—The nation's first carbon black plant was opened late in 1974 at Ahwaz. The 16,000-ton-per-year capacity plant is owned and operated by the Iran Carbon Co. Equity in the company is held by the Cabot Corp. (United States) 50%, the Industrial Mining and Development Bank of Iran 30%, and the NPCI 20%. During 1975, its first full calendar year of operation, the plant produced 5,800 tons of carbon black. Plant feedstock is based on natural gas from the Ahwaz Field and oil residues from the Abadan refinery.

Natural Gas.—Gross production of natural gas reached 1.6 trillion cubic feet in 1975. The bulk of production is derived from the Khuzestan area in Southern Iran where gross production was reported at 1.4 trillion cubic feet for the year. More than half of the total gross production of natural gas is flared; however, flared gas expressed as a percentage of total gas production was reduced to 52% in 1975 as compared with 59% in 1973. Gas flaring will be discontinued in the near future as Iran implements its multiple gas utilization programs which include gas injection for enhanced recovery operations in the Khuzestan oilfields, expansion of the natural gas-based chemical industry, steel production based on direct reduction of iron ore, and export of natural gas in both liquid and gaseous states.

During 1975 facilities were under construction for injection of well over 1 billion cubic feet per day of natural gas into the Gachsaran and Marun oil reservoirs. Also under construction were facilities to inject dome gas from Naft-Sefid into the Haft Kel and Paris reservoirs.

Two natural gas liquefaction projects were underway in 1975. The Kalingas group in which the National Iranian Gas Co. (NIGC) holds 50% equity with a consortium of United States, Norwegian, and Japanese firms reviewed designs for liquefaction units to ultimately provide 1.6 billion cubic feet of gas per day, most of which is destined for the Japanese market. NICG launched a second liquefaction project as a joint venture with U.S.-American-Belgium consortium for the ultimate export of 2 billion cubic feet of gas per day to Europe and the United States.

The export of natural gas in a gaseous state has long been established in Iran. During 1975 more than 1 billion cubic feet per day was delivered to the Soviet Union via the Iranian Gas Trunkline (IGAT) which connects the Iranian southern fields with the U.S.S.R. on the Astara border, a distance of nearly 700 miles. A parallel line will be constructed at a cost of $2 billion to transport an additional 1.3 billion cubic feet per day to the Soviet Union. In turn, the U.S.S.R. will forward 1.1 billion cubic feet per day from the Siberian fields to Western Europe via a 2,500-mile line to the Czechoslovakian border. From that point, 530 million cubic feet per day would be shipped to West Germany, 350 million cubic feet per day to France, and the remainder to Austria.

Natural Gas Liquids.—Nearly 600 billion cubic feet of associated gas was transferred to natural gas liquid (NGL) recovery units at the Ahwaz, Marun, and Agha-Jari Fields. Raw NGL was recovered at these production sites and piped to the Bandar Mahshahr NGL refinery where 1975 production was reported at 3.3 million barrels of propane, 3.7 million barrels of butane, and 5 million barrels of natural gasoline. Associated natural gas production from the offshore Darius Field is treated at the Kharg Chemical Co. complex where 1975 production of NGL was reported at 1.1 million barrels of propane, 0.7 million barrels of butane, and 0.7 million barrels of natural gasoline.

Nuclear Energy.—The Atomic Energy Organization of Iran announced plans to produce 23,000 megawatts of nuclear power by 1994. Contracts have been awarded for the purchase and construction of nuclear powerplants totaling 5,000 megawatts-per-year capacity. These plants should come onstream in 1982 and 1983.

Petroleum.—Exploration and development activities were maintained at an accelerated pace. Total footage drilled was 1,307,154 for 133 well completions as compared with 1,065,200 feet drilled for 99 well completions in 1974. Iran's largest operator, the Oil Service Co. of Iran (OSCO), drilled 983,400 feet for completion of 64 development wells and 6 exploratory wells. Of the six exploratory wells, three resulted in oil discoveries, one well was dry, and two were suspended.

As a result of reduced world demand, petroleum production for 1975 averaged 5.3 million barrels per day representing a decrease of more than 11% from the previous year's production level. The bulk of Iran's production, 4.9 million barrels per day, was obtained from 20 onshore fields in Southwest Iran operated by OSCO under contract to the National Iranian Oil Co. (NIOC). Among the larger fields operated by OSCO are the Marun Field, averaging nearly 1.2 million barrels per day of 34° API gravity crude; the Ahwaz-Azmari, averaging 0.9 million barrels per day of 32° API gravity crude; the Agha Jari, averaging 0.8 million barrels per day of 34° API gravity crude; and the Gachsaran, averaging 0.7 million barrels per day of 31° API gravity crude. During 1975 OSCO launched an enhanced recovery project which will eventually require the injection of 13 billion cubic feet of gas per day into six southwestern oilfields including the Agha-Jari and Gachsaran Fields. The gas injection program should boost recovery to 40% of oil in place rather than the 20% to 30% recovery anticipated from primary depletion.

More than 90% of Iran's oil production is recovered by OSCO for NIOC. The remaining production is obtained from offshore operations of four companies. NIOC holds 50% equity in each of these companies. The largest offshore producer is the Iran Pan American Oil Co. (IPAC) producing a total average of 177,000 barrels per day from its Darius, Cyrus, and Fereidoon Fields. The Fereidoon Field entered production in late 1974 at 30,000 barrels per day. By yearend 1975 production increased to 125,000 barrels per day and peak production of 150,000 barrels per day is anticipated by mid-1976. Production from the Darius Field dropped to 60,000 barrels per year by yearend, about half of its peak production level. Completion of a reworking project should boost production to 70,000 barrels per day, while completion of an additional development well will boost field production to 80,000 barrels per day in 1976. The Cyrus Field produced at an average 35,000 barrels per day. A fourth field was under IPAC development in 1975. The Ardeshir Field is scheduled for production by mid-1976 at a rate of 20,000 barrels per day rising to 200,000 barrels per day by yearend 1977. Crude oil from Ardeshir is to be carried by pipeline to the Kharg Island shipping terminal. Construction of the 60-mile long pipeline and of onshore storage and loading facilities was near completion at yearend 1975.

The Lavan Petroleum Co. (LAPCO) produced 175,000 barrels per day from the Sassan Field. LAPCO is scheduled to bring the Bahram Field into production by 1977. Construction of a pipeline connecting the field to Lavan Island and construction of a 1-million-barrel storage facility on Lavan Island was near completion by yearend.

The Société Irano-Italienne de Pétroles (SIRIP) produced a combined average of 53,000 barrels per day in 1975 from its Nowruz, Hendijan, and Bahregansar Fields. Development work on the onshore Shurom Field continued. By the fourth quarter the Shurom No. 7 well was completed at a depth of 9,918 feet. Production from the Shurom Field is anticipated in 1976.

The Iranian Marine International Oil Co. (IMINOCO) produced a combined average of 53,000 barrels per day. Production was derived from its Rakhsh and Rostam Fields.

Other companies which include NIOC 50% equity participation are the Iran Nippon Petroleum Co. (INPECO), Phillips Petroleum Co. Iran (FILIRAN), and Hormuz Petroleum Co. (HOPECO). Exploration and development drilling activities were conducted in concession areas held by these groups but no production has yet been reported.

Iran exports most of its onshore production and all the crude production from offshore fields. Crude exports for 1975 averaged 4.67 million barrels per day or 88% of total production. The remaining crude output, about 630,000 barrels per day is refined in Iran. The Abadan refinery, Iran's largest, recorded a throughput average of nearly 450,000 barrels per day and a product output averaging over 435,000 barrels per day in 1975. Expansion of the Abadan refinery was undertaken in March 1974 and by mid-1976 the Abadan refining capacity should be 600,000 barrels per day ranking it among the world's largest refineries. Additional expansion programs are slated for the refinery, bringing it to an ultimate planned capacity of 1.5 million barrels per day. The Teheran refinery, also under expansion, recorded a crude throughput averaging 165,000 barrels per day and a product output averaging 157,000 barrels per day. The Shiraz refinery reported a 36,000-barrel-per-day average throughput and a product output averaging 33,000 barrels per day. Kermanshah refinery throughput averaged 17,000 barrels per day with a product yield averaging nearly 16,000 barrels per day. The Masjid Sulaiman topping plant recorded a throughput average of 16,000 barrels per day for a product yield averaging 14,000 barrels per day.

Construction of the 80,000-barrel-per-day capacity Tabriz refinery was underway by June 1975 under contract to Snam-Progetti. The refinery completion date is scheduled for mid-1977. Construction of a 20,000-barrel-per-day topping plant on Lavan Island continued in 1975 with completion scheduled for mid-1976. Fluor-Thyssen was awarded a contract for construction of a 200,000-barrel-per-day refinery at Isfahan. The refinery completion date is scheduled for 1979.

Plans for the construction of several joint venture 500,000-barrel-per-day capacity export-oriented refineries have been suspended. However, NIOC did sign agreements in 1975 establishing a joint-venture refining operation with Senegal and one with South Korea. Each joint venture involves the construction and operation of a 60,000-barrel-per-day capacity refinery.

The Mineral Industry of Iraq

By John L. Albright [1]

The Government abolished the Iraqi National Minerals Co. and replaced it with the General Minerals Organization, under the Ministry of Industry and Minerals. The new organization will undertake geological and geophysical surveys and will explore for, develop, and market minerals in Iraq.[2] The Ministry of Economy was also abolished and the Government established in its place the Ministry for Foreign Trade and the Ministry for Internal Trade.

Iraq joined eight other countries (Egypt, Jordan, Kuwait, South Yemen, Sudan, Syria, United Arab Emirates, and Yemen) to form the Arab Co. for Mining and signed an agreement with the U.S.S.R. under which the Soviets will establish vocational training centers in Iraq that will include training for the mining and petrochemical industries. A petroleum training center was already in operation in Iraq, and a facility to train iron and steel industry workers was under construction.

The Government's Planning Ministry finalized the 5-year plan for the period 1976–80, allocating about $33.8 billion [3] for investments. The plan would concentrate on developing the agricultural and industrial sectors of the economy.

The petroleum industry remained the most important mineral activity in Iraq, and it was dominated by the Iraq Co. for Oil Operations (ICOO), and the Iraq National Oil Co. (INOC), both owned and operated by the Government. The country was one of the largest producers and exporters of oil in the Middle East and was an active member of the Organization of Arab Petroleum Exporting Countries (OAPEC) and the Organization of Petroleum Exporting Countries (OPEC).

Iraq's oil revenues were estimated to total $7.6 billion in 1975, an increase of $1.9 million over those of 1974. Oil revenues for the period April 1 to December 31, 1975, were estimated to have accounted for $4.1 billion of the Iraqi budget for that 9-month period. Beginning with January 1, 1976, the fiscal year will correspond to the calendar year instead of the previously-used April to March fiscal year. Total State revenues for the April 1 to December 31, 1975, 9-month period were budgeted at $10.8 billion and expenditures at $12.3 billion. State revenues in the budget allocations for the 1974–75 (old) fiscal year, however, totaled $10.2 billion, while expenditures totaled $12.3 billion.[4]

The Iraqis developed plans to establish several petrochemical plants near Al Başrah. A project was approved to establish a plant to produce fertilizer materials, and the Government examined plans to build an ethylene plant nearby. Preliminary discussions were also held with Kuwait for the establishment of a joint petrochemical complex, but details of the project were not publicized. During 1975, Iraq was developing its petroleum industry and establishing several new heavy industries, namely aluminum, and iron and steel. Projects were developed to improve the country's transportation facilities to serve the growing economy. Tanker terminal facilities were constructed at Al Bakr on the Persian Gulf near Khor al Khafka to serve the newly completed north-south crude oil pipeline. During the next 5 years, the port facilities will be expanded at

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

[2] Middle East Economic Survey (Beirut, Lebanon). RCC Establishes General Minerals Organization to Replace INMC. V. 18, No. 25, Apr. 11, 1975, pp. 6–7.

[3] Where necessary, values have been converted from Iraqi dinars (ID) to U.S. dollars at the rate of ID1.00=US$3.38.

[4] Middle East Economic Survey (Beirut, Lebanon). Iraq's Oil Revenues for April–December 1975 Estimated at Over $4 Billion. V. 18, No. 44, Aug. 22, 1975, p. 2.

Umm Qaṣr, the railroad system will be upgraded and possibly connected to that of Syria, and new airports will be constructed at Al Baṣrah, Al Mawṣil, and Kirkūk. Several pipelines were under construction in 1975, including an export line to a tanker terminal at Dortyol, Turkey, on the Mediterranean Sea.

The country's power generating capacity will also be increased to serve the growing demand for electricity, and three West German firms received contracts during the year to supply powerplants to Iraq. AEG-Kanis Turbinenfabrik GmbH will supply a 40-megawatt plant for the Kirkūk area, AEG-Telefunken will double the capacity of the Dawrah powerplant, and Brown Boveri will install a 250-megawatt powerplant at Khor al-Zubair. Contracts were also signed during 1975 with foreign companies to build electric-generating powerplants at Al Mawṣil and Taji (near Baghdād), and Techno-Brom Export of the U.S.S.R. was awarded a contract to build an 840-megawatt plant in the southern Zikari district. Iraq held separate discussions with France and the U.S.S.R. on the peaceful use of atomic energy and discussed a project to connect the Iraqi electric power network with the systems in Kuwait, Lebanon, and Syria.

Relative to these expansion plans, it should be noted that the limited number of technicians and skilled workers, however, has been a serious problem, and the Government launched a program to attract Iraqis working in foreign countries and to attract other Arabs whose skills may be utilized in Iraq.

PRODUCTION

During 1975, Iraq increased its output of crude oil to a record 757 million barrels (averaging 2.1 million barrels per day), while most of the OPEC members reduced their production. Iraq was the third largest producer in the Middle East after Saudi Arabia and Iran. The Government oilfields accounted for slightly more than one-half of the output, and the remainder came from fields operated by the Basrah Petroleum Co., Ltd. (BPC). Total oil production in the country averaged nearly 2.2 million barrels per day during the first 6 months of the year, peaked at 2.5 million barrels per day in September, and fell to just under 2.1 million barrels per day in December. Iraq continued to expand its oil producing capacity but reportedly reduced its 1980 target level of 6 million barrels per day to 4.4 million barrels per day.

Table 1.—Iraq: Production of mineral commodities

Commodity [1]	1973	1974	1975 [p]
Cement, hydraulic [e] ____thousand metric tons__	1,800	1,800	1,800
Gas, natural:			
Gross production ____million cubic feet__	[r] 308,260	[e] [r] 329,237	368,648
Marketed ____do____	42,731	[e] [r] 41,988	58,410
Petroleum:			
Crude ____thousand 42-gallon barrels__	740,619	720,729	756,682
Refinery products:			
Gasoline ____do____	3,796	4,412	4,501
Jet fuel ____do____	4,599	1,175	1,199
Kerosine ____do____		4,118	4,200
Distillate fuel oil ____do____	11,060	7,973	8,030
Residual fuel oil ____do____	5,183	5,278	5,383
Lubricants ____do____	NA	353	360
Other ____do____	4,220	9,256	9,441
Refinery fuel and losses ____do____	1,109	2,017	2,057
Total ____do____	29,967	34,582	35,171
Salt [e] ____thousand metric tons__	60	60	60
Sulfur, elemental:			
Native, Frasch ____do____	395	[e] [r] 609	650
Byproduct [e] ____do____	140	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, and sand and gravel) are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

TRADE

During 1975, crude oil accounted for the bulk of Iraq's mineral exports. About 55% of the crude oil was exported by the Government (ICOO and INOC) and the remainder by BPC; the oil was exported at an average rate of 2.1 million barrels per day.

Iraq took major steps during 1975 to improve relations with its neighbors. A treaty was signed by Iran and Iraq that settled a long-standing dispute over the land boundaries and the Shatt al-'Arab waterway between Iran and Iraq. A trade agreement signed with Bahrain called for exchanging industrial products and raw materials and for establishing joint companies and projects. The agreement provides for trade centers to be maintained in the two countries, and each will allow its citizens to reside and work in the other country. Iraq and Saudi Arabia signed an agreement providing for the partition of the Neutral Zone located between the two countries, situated to the west of Kuwait. An economic and technical cooperation protocol was signed with Jordan that should lead to increased trade, and it provided for Iraqi participation in several Jordanian development projects. Discussions were also held with Kuwait concerning a long-standing border dispute, but a settlement was not reached by yearend.

Table 2.—Iraq: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal, waste and scrap	87	--
Iron and steel:		
Scrap	250	--
Primary metal and semimanufactures	--	(1)
Lead metal:		
Scrap	450	(1)
Unwrought and semimanufactures	836	450
Zinc metal, scrap	2,311	1,600
NONMETALS		
Asbestos	207	--
Cement	506,187	190,365
Chalk	11	19
Clay products, nonrefractory	998	27
Fertilizer materials:		
Crude	2,100	--
Manufactured, nitrogenous	26,645	7,764
Ammonia	16	5
Gypsum and plasters	5,000	3,000
Lime	2,100	--
Stone, sand and gravel:		
Dimension stone, unworked	407	643
Gravel and crushed stone	48,324	12,017
Sand, excluding metal bearing	2,135	660
Sulfur, sulfuric acid	19	29
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	47,446	70,065
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	704,610	686,200
Refinery products:		
Gasoline do	315	67
Kerosine do	258	416
Distillate fuel oil do	r 776	1,290
Residual fuel oil do	29	850
Lubricants do	22	56
Other:		
Liquefied petroleum gas do	6	117
Mineral jelly and wax do	21	36
Total do	r 1,427	2,832

r Revised.
1 Less than ½ unit.

Table 3.—Iraq: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Oxide	51	6,175
Metal, including semimanufactures	r 3,353	--
Copper, unwrought and semimanufactures	1,897	1,241
Iron and steel:		
Pig iron, including cast iron	1,028	2,796
Sponge iron, powder and shot	10,294	380
Ferroalloys	3	--
Steel primary forms:		
Ingots	r 1,492	574
Tube and pipe blanks	r 11,970	215,556
Semimanufactures ______thousand tons	r 438	1,113
Lead:		
Oxide	50	--
Metal including alloys, all forms	563	26
Magnesium and beryllium	536	325
Mercury ______76-pound flasks	77	420
Nickel metal including alloys, all forms	16	4
Platinum group metals and silver ______troy ounces	1,318	804
Rare-earth metals including alloys, all forms	--	21
Tin:		
Oxide	3	--
Metal including alloys, all forms	122	82
Titanium oxides	790	1,228
Zinc:		
Oxide and peroxide	201	529
Metal including alloys, all forms	863	777
Other:		
Ores and concentrates of base metals, n.e.s	40	57
Ash and residues containing nonferrous metals	54	--
Oxides, hydroxides and peroxides of metals, n.e.s	36	244
Metals including alloys all forms:		
Metalloids	2	5
Pyrophoric alloys	2	25
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	(1)	1
Grinding and polishing wheels and stones	198	90
Asbestos	1,556	2,872
Barite and witherite	10,427	8,729
Boric oxide and acid	100	3
Cement, hydraulic	r 116,712	58,798
Chalk	52	224
Clays and clay products:		
Crude clay	10,575	17,146
Products:		
Refractory (including nonclay brick)	r 7,035	266
Nonrefractory	4,266	9,690
Diamond, gem not set or strung ______thousand carats	95	482
Fertilizer materials:		
Crude, natural	(1)	--
Manufactured:		
Nitrogenous	10,007	12,406
Phosphatic	15,051	7,500
Potassic	4	--
Ammonia	50	--
Graphite, natural	(1)	36
Lime	3	2
Mica, all forms	20	18
Pigments, mineral:		
Natural crude	932	3,661
Iron oxides, processed	282	595
Salt	500	(1)
Sodium and potassium compounds, n.e.s.:		
Caustic soda	9,082	10,076
Caustic potash	2	11
Stone, sand and gravel:		
Dimension stone, crude and partly worked	102	175
Gravel and crushed stone	2	--
Limestone (except dimension)	310	343
Sand	30	--
Sulfur:		
Elemental: Other then colloidal	25	130
Sulfuric acid	--	66

See footnotes at end of table.

Table 3.—Iraq: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Talc, steatite, soapstone, and pyrophyllite	476	165
Other nonmetals, n.e.s.: Oxides and hydroxides of strontium, magnesium, barium	2	9
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	323	895
Carbon black	122	211
Coal and coke, including briquets	608	921
Hydrogen, nitrogen and rare gases	10	2
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	5	20
Kerosine do	204	--
Distillate fuel oil do	504	(1)
Residual fuel oil do	--	(1)
Lubricants do	3	4
Other:		
Liquefied petroleum gas do	(1)	--
Mineral jelly and wax do	(1)	1
Nonlubricating oils, n.e.s do	(1)	--
Pitch do	(1)	5
Bituminous mixtures, n.e.s do	11	109
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	--	3,453

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—The Government established the General Co. for the Manufacture of Aluminum Ingots to manage the aluminum smelter that was under construction at An Nāṣirīyah, on the Al Furāt River between Al Baṣrah and Baghdād. The plant will process imported alumina. The project will utilize large amounts of electricity, and production will commence in 1977 at a rate of about 30,000 tons of aluminum per year. A plant will be built at Zikar to produce up to 22,000 tons per year of aluminum bars, foil, sheet, and wire. The Government asked for international bids for the construction of a large aluminum smelter in Iraq that would have a capacity of 300,000 tons per year.

India and Iraq held discussions concerning a project to establish an alumina smelter in Iraq that would process bauxite from India. The plant would probably be located near Al Baṣrah, in southern Iraq.

Iron and Steel.—An iron and steel mill was under construction at Khor al-Zubair and scheduled to begin operations during 1977. Japan and the U.S.S.R. were assisting Iraq with the project that will have an initial capacity of about 1.2 million tons per year of sponge iron and about 420,000 tons of steel beams, pipes, rods, and sheets. The electric furnaces for the project will be supplied by Poland, and iron ore will be imported. The project will use domestic natural gas for fuel. Studies were under consideration to increase the production capacity for sponge iron to 3 million tons per year and the production capacity of iron and steel products to 1.2 million tons per year. Most of the increase will probably be exported. During 1975, Iraq negotiated a project with the Soviet Union under which that country would assist Iraq in constructing a plant to produce steel sheet at the rate of 1.5 million tons per year at the Khor al-Zubair complex. Iraq discussed several iron and steel projects with India, including the establishment of a sponge iron plant in Iraq and an iron pelletization plant in India.

NONMETALS

Cement.—Production facilities were being enlarged, and the Government approved projects to build a 500,000-ton-per-year cement plant in the El Mathna region and one at Al Kūfah, rated at 1 million tons per year. The country's capacity to produce cement was scheduled to reach 7 million tons per year by 1977, and 9 million tons per year by 1980.

Fertilizer Materials.—Domestic natural gas and phosphate will be used to produce fertilizer materials for export at a new plant scheduled to be built in southern Iraq. Mitsubishi Heavy Industries Ltd. of Japan negotiated a $570-million contract with Iraq to build an ammonia-urea production complex at Khor al-Zubair. The plant will have a capacity to produce 1,800 tons per day of ammonia and 2,700 tons per day of urea. The plant will utilize natural gas feedstocks and will have two urea production lines, the first scheduled for completion in 1977 and the second in 1979.

Deposits of phosphate rock were discovered near Akkashat in western Iraq in 1970 by a team of Iraqi and Soviet geologists. Mines will be developed, and phosphate ore will be produced at the rate of about 3.4 million tons per year. A plant near Khor al-Zubair will produce fertilizer for export at the initial rate of 1 million tons per year, expandable to 2 million tons per year.

Stone.—*Marble.*—Iraq reportedly developed plans and signed a contract valued at $30 million with an Italian firm for the construction of facilities at Anbar, As Sulaymānīyah, and Nīnawá for the production of block marble. Expected completion dates for the projects and rates of output were not publicized.

MINERAL FUELS

Natural Gas.—At yearend 1975, Iraq's proven reserves of natural gas were estimated at 53 trillion cubic feet, the fourth largest in the Middle East. During 1974, Iraq began developing plans to utilize large quantities of natural gas, and in 1975 the Government issued contracts to several foreign companies to design specific programs to use the gas. Procon Great Britain, Ltd., and two U.S. companies will prepare a study on production and utilization of natural gas from the central and northern fields,[5] and Nippon Kokan Mitsubishi of Japan was awarded a contract valued at $91 million to make natural gas from the Rumaila Field in southern Iraq available to industrial projects nearby. Plans were also developed during the year to utilize the gas to power electrical generating plants and to be used for feedstock to new industries.

Petroleum.—Iraq's petroleum industry was actively engaged in exploration and development projects during 1975, when an estimated 45 oil wells were drilled, of which only 9 were reported as dry holes. During 1975, the drilling totaled nearly 121,400 meters, and a major oil discovery reportedly was made west of Baghdād. Details of the find were not publicized, but the Iraqi press stated that the new oilfield was of gigantic size. Crude oil reserves at yearend 1975 were estimated by several industry sources to total 34.3 billion barrels, although the Government reported the reserves at 75 billion barrels.

Indian, Iraqi, and Romanian teams searched for oil in Iraq. The Indian Oil and Natural Gas Commission conducted a seismic survey and began drilling the first exploratory well on its concession in southern Iraq, and INOC awarded at $3-million contract to the Indians to carry out seismic work in other areas of southern Iraq. Seismic surveys were scheduled also for 1975 to be carried out in the Khanaqin area by a company from the U.S.S.R. and in Al-Kufl area west of Kirkūk by an East German company. The Government oil company carried out exploratory activities in a small area west of the prolific Kirkūk oilfield. Earlier, INOC had contracted a Romanian company to conduct exploratory operations, and during 1975 the Romanians began drilling the first of five oil wells.

A computation of geodesic lines along with economic and topographic maps of Iraq will be prepared by a Polish firm. Negotiations with Czechoslovakia resulted in an agreement under which Iraqi geologists will be trained in Czechoslovakia, and Czechoslovak specialists will assist the Iraqis in geological field studies in Iraq.

In December 1975, the Iraqi Government nationalized the remaining foreign interests in oil operations in the country, the 57% foreign ownership of the BPC. The companies affected by the Government's action were the British Petroleum Exploration Co. (Middle East) Ltd., Compagnie Française des Pétroles, and the Royal Dutch-Shell Group.[6] During 1973, the Government had nationalized 43% of the holdings in BPC that had been owned by petroleum companies in Portugal, the Netherlands, and the United States.

Iraq and the Soviet Union signed a contract in 1975 providing for the develop-

[5] Oil Daily. Procon Unit Heads Iraq Gas Study Consortium. No. 5816, Jan. 24, 1975, p. 6.

[6] Wall Street Journal. Iraq to Nationalize All Foreign Interests In Its Oil Operations. V. 186, No. 113, Dec. 9, 1975, p. 18.

ment of the Lahis oilfield in southern Iraq.[7] The field should be operational in 1978, producing as much as 50,000 barrels of oil per day. Under terms of the contract, the U.S.S.R. will supply the equipment necessary for the production of crude oil from that field. Development work continued during the year on the Nahran Umar, North Rumaila, Abu Ghirab, and Buzurgan oilfields. The Nahran Umar Field began production during the year, and the Abu Ghirab and Buzurgan Fields will begin production in 1976. In October 1975, the ICOO signed a $176-million contract with an undisclosed firm for the construction of oilfield equipment necessary to develop the Bāy Ḩasan and Jambur oilfields in northern Iraq.

The Iraq Oil Tankers Co. (IOTC) took delivery of the first of four 125,000-deadweight-ton tankers from a Japanese shipyard. The second 125,000-deadweight-ton ship and one of 144,000 deadweight tons will be delivered from Japan during 1976. IOTC also had four tankers of 145,000 deadweight tons on order from a Swedish shipyard, scheduled for delivery during 1976 and 1977.

Five petroleum and two natural gas pipelines with an aggregate length of nearly 2,700 kilometers were under construction during 1975, and orders valued at $90 million were placed with four Japanese companies for steel pipe to be used in these projects.

The Abu Ghurab—Buzurgan line will transport the output from those oilfields to the southern port for export, and the Baghdād—Al Başrah petroleum products line will permit transferring fuels between petroleum refineries near those two cities, beginning in 1976. The Al Ḩadīthah to Rumaila crude oil trunkline and its parallel gasline were completed during the year. The oil line has flow-reversal capability, giving the Iraqis flexibility in transporting crude oil to the Mediterranean or to the Persian Gulf for export. The new Kirkūk line will connect the northern oilfields to tanker terminal facilities on the Mediterranean Sea at Dortyol, Turkey, and should be ready for service in 1977 with an initial throughput capacity of 500,000 barrels of oil per day. Turkey will offtake some 200,000 barrels of oil per day from the line, and the rest will be loaded on tankers for European markets.[8]

Plans were finalized and a contract issued for the construction of a 122-centimeter diameter, 35-kilometer gasline from the South Rumaila Field to the site of the proposed natural gas liquids production complex at Khor al-Zubair. Nippon Kokan Kaisha of Japan will begin construction of the pipeline during 1976, and the project should be completed by 1977. The natural gas liquids plant may be placed in service by yearend 1977, and reportedly will have a capacity to produce liquefied petroleum gases at the rate of 8,700 barrels per day and natural gasoline at the rate of 3,500 barrels per day. Most of the plant's output will be exported.

Two Japanese companies, Marubeni Corp. and Niigata Engineering Co., will build a 1,200-barrel-per-day, $100-million lubricating oil plant at Daura, near Baghdād. The project was slated for completion in 1978. Fourteen plants were established throughout the country at a cost of $5.1 million to produce asphalt for a large-scale road paving program launched by the Government.

[7] Middle East Money. New Soviet Oil Exploration Contract. V. 2, No. 43, Oct. 27, 1975, p. 5.
[8] Petroleum Economist. Pipeline Contracts Issued. V. 42, No. 1, January 1975, p. 30.

Table 4.—Iraq: Pipelines under construction

From	To	Product	Length (kilometers)	Diameter (centimeters)
Abu Ghurab and Buzurgan	Fao	Crude	170	NA
Baghdād	Al Başrah	Refined petroleum products	545	20
Al Ḩadīthah	Rumaila	Crude	655	dual 107
Kirkūk	Turkey border	do	[1] 341	102
North Rumaila	Fao	do	[e] 160	122
Al Ḩadīthah	Rumaila	Natural gas	655	46
North Rumaila	do	do	[e] 160	25

[e] Estimate. NA Not available.
[1] Iraqi section only. Line in Turkey from the border to Dortyol will be 640 kilometers in length.

The Mineral Industry of Ireland

By William F. Keyes [1]

Inflation, unemployment, and recession characterized the Irish economy in 1975. As a result of inflation, the real gross national product (GNP) declined an estimated 3.5%, although in current prices it increased 21% over that of 1974 to about 3,535 million Irish pounds (approximately US$7.8 billion).[2] Production of domestic minerals amounted to about 1% of the GNP.

Significant growth in base metal mining was assured by the granting of a lease by the Government for a large, new lead-zinc mine and by plans for a lead-zinc smelter. Planning also continued for the building of a major ammonia plant, and agreements to supply offshore natural gas to Irish industry were signed. On the other hand, one of the two copper mines was closed because of exhaustion of ore reserves, and exploration for additional hydrocarbons offshore was unsuccessful.

PRODUCTION

Ireland had a significant production of base metals, peat, and cement in 1975; only the base metal production was important in world markets. Copper production was about 0.2%; lead, 1.1%; and zinc, 1.2% of total world production. Concentrates of these metals were all exported, there being no base metal smelter in Ireland Plans were being made, however, for a lead-zinc smelter.

Production of copper, lead, and cement declined in 1975. Zinc production did not decrease, presumably because of increasing zinc content in ores mined at lower depths in one major mine.

[1] Supervisory physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from Irish pound (£) to U.S. dollars at the rate of 1£=US$2.36 in May and 1£=US$2.05 in November.

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

Commodity [1]	1973	1974	1975 p
METALS			
Copper, mine output, metal content	r 13,005	12,701	9,856
Lead, mine output, metal content	r 56,188	37,695	36,273
Iron and steel, crude steel ---- thousand tons	116	110	82
Mercury ---- 76-pound flasks	1,345	775	423
Silver, mine output, metal content - thousand troy ounces	1,839	1,980	1,384
Zinc, mine output, metal content	r 68,787	66,348	66,653
NONMETALS			
Barite	r 270,300	344,600	295,000
Cement, hydraulic ---- thousand tons	r 1,807	1,669	1,561
Gypsum ---- do	436	384	331
Lime ---- do	76	r e 79	78
Pyrite ---- do	67	57	70
Sand and gravel [2] ---- do	6,078	6,182	5,036
Stone, limestone [2] ---- do	r 8,982	8,108	6,920
Other [3] ---- do	4,248	3,092	3,288

See footnotes at end of table.

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

Commodity [1]	1973	1974	1975 [p]
MINERAL FUELS AND RELATED MATERIALS			
Coal, anthracite and bituminous ---------- thousand tons --	[r] 63	68	48
Coke, gashouse including breeze ---------- do ----	37	[r e] 34	34
Peat:			
Agricultural use ---------- do ----	77	[r e] 74	67
Fuel use:			
Briquets ---------- do ----	326	312	359
Sod peat [4] ---------- do ----	1,986	1,935	2,099
Milled peat [5] ---------- do ----	1,864	2,324	4,776
Petroleum refinery products:			
Gasoline ---------- thousand 42-gallon barrels --	3,904	4,076	4,277
Jet fuel ---------- do ----	626	[r e] 756	823
Distillate fuel oil ---------- do ----	5,177	4,912	4,476
Residual fuel oil ---------- do ----	[r] 8,344	8,452	7,678
Other:			
Liquefied petroleum gas ---------- do ----	460	448	470
Naphtha ---------- do ----	485	318	312
Refinery fuel and losses ---------- do ----	[r] 320	801	836
Total ---------- do ----	[r] 19,316	19,763	18,872

[e] Estimate. [p] Preliminary. [r] Revised.
[1] In addition to the commodities listed, substantial quantities of stone, sand, and gravel are produced by local authorities for such purposes as road maintenance, but statistics on 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

The Irish economy continued to depend on imports for most of its metals and metal semimanufacture needs. The United Kingdom was the overwhelming supplier of minerals and metals to Ireland, except for crude petroleum imported from the Middle East. Irish exports of base metals were sent to smelters in Spain, France, the Netherlands, and West Germany. U.S. trade chiefly has been Irish barite exported to the U.S. petroleum industry.

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

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal including alloys:			
Scrap	239	459	United Kingdom 203.
Unwrought and semimanufactures	r 4,435	4,326	United Kingdom 3,521.
Copper:			
Ore and concentrate	11,142	32,222	Spain 16,116; Sweden 16,106.
Metal including alloys:			
Scrap	4,627	4,643	United Kingdom, 1,729; Belgium-Luxembourg 1,474.
Unwrought	40,479	14,144	Spain 10,640; Sweden 2,300.
Semimanufactures	1,513	1,472	United Kingdom 1,184
Iron and steel:			
Roasted iron pyrite	38,426	29,019	NA.
Metal:			
Scrap	12,684	11,196	United Kingdom 3,822; West Germany 3,657; Spain 3,133.
Semimanufactures	83,570	43,020	United Kingdom 33,519.
Lead:			
Ore and concentrate	126,175	74,195	Belgium-Luxembourg 24,860; West Germany 15,698; France 14,730.
Metal including alloys, unwrought and semimanufactures	r 2,682	4,683	France 2,992; United Kingdom 1,691.
Nickel:			
Ore and concentrate	20	--	
Metal:			
Scrap	108	--	
Unwrought and semimanufactures	173	178	Switzerland 69; West Germany 55.
Platinum-group metals, and silver:			
Ore and concentrate	8	11	NA.
Metals including alloys, all forms:			
Platinum -- value, thousands	$604	$1,531	United Kingdom $1,451.
Silver do	$176	$494	United Kingdom $490.
Zinc:			
Ore and concentrate	150,006	133,916	France 42,118; Belgium-Luxembourg 26,690; United Kingdom 16,871.
Metal including alloys:			
Scrap	(1)	588	United Kingdom 234.
Unwrought and semimanufactures	387	463	United Kingdom 426.
Other:			
Ore and concentrate	--	173	NA.
Ash and residue containing nonferrous metals	785	584	United Kingdom 541.
Metals including alloys, all forms, n.e.s	279	238	NA.
NONMETALS			
Abrasives, natural, n.e.s	--	52	NA.
Asbestos	88	217	NA.
Cement	168,545	156,956	United Kingdom 146,002.
Clays and clay products:			
Crude clays, n.e.s	35,385	34,555	United States 31,980.
Products:			
Refractory (including nonclay bricks)	63,456	63,801	United Kingdom 15,133; West Germany 13,478; Italy 12,362.
Nonrefractory	15,378	4,907	United Kingdom 4,887.
Fertilizer materials:			
Crude:			
Phosphatic	27	947	All to United Kingdom.
Other	5,105	2,694	Do.
Manufactured:			
Nitrogenous	14,491	9,447	United Kingdom 7,443; United States 2,004.
Phosphatic	6,299	96,665	East Germany 19,133; Brazil 16,829; Libya 15,386.
Potassic	19	1,007	NA.
Other	40,639	100,695	United Kingdom 25,316; Colombia 25,179; Cuba 20,000.
Gypsum and plasters	143,352	85,296	NA.
Lime	9	13	NA.
Mica, all forms	14	6	NA.
Salt	49	221	NA.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	469	292	NA.
Worked	237	150	NA.
Gravel and crushed stone	420,022	295,708	NA.
Limestone	(2)	(2)	NA.
Sand, excluding metal bearing	78	223	NA.
Sulfur, elemental, other than colloidal	--	27,593	United Kingdom 24,445.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Other nonmetals, n.e.s.:			
Crude	238,080	333,950	NA.
Slag, dross and similar waste, not metal bearing	--	38	NA.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	12,630	13,133	NA.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	38	51	NA.
Coal and briquets:			
Anthracite and bituminous coal	66,053	32,189	United Kingdom 10,601; West Germany 8,963; France 6,222.
Briquets of anthracite and bituminous coal	4,715	6,705	NA.
Coke and semicoke	34,185	40,839	Sweden 25,839; Netherlands 12,250.
Peat including briquets and litter	123,800	127,634	United Kingdom 126,112.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	47	46	All to United Kingdom.
Kerosine do	2	2	NA.
Distillate fuel oil do	221	168	All to United Kingdom.
Residual fuel oil do	2,970	2,628	Do.
Lubricants do	34	8	United Kingdom 7.
Other:			
Liquefied petroleum gas do	r 43	33	All to United Kingdom.
Unspecified do	43	--	
Total do	r 3,360	2,885	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	66,770	4,012	NA.

r Revised. NA Not available.
[1] Included with other: Ash and residue containing nonferrous metals.
[2] Included with gypsum and plasters.

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

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	40	10	NA.
Oxide and hydroxide	2,895	3,249	NA.
Metal including alloys:			
Scrap	450	770	United Kingdom 713.
Unwrought	6,009	6,326	Canada 4,669; United Kingdom 1,506.
Semimanufactures	8,606	10,487	United Kingdom 7,942.
Arsenic trioxide, pentoxide, acids	11	74	NA.
Chromium:			
Chromite	12,119	13,051	Mozambique 6,330; Turkey 5,350.
Oxide and hydroxide	38	53	NA.
Cobalt oxide and hydroxide	173	31	NA.
Copper metal including alloys:			
Scrap	212	127	NA.
Unwrought	317	274	United Kingdom 226.
Semimanufactures	12,075	11,403	United Kingdom 9,775; West Germany 526.
Iron and steel metal:			
Scrap	44,133	25,266	United Kingdom 23,284
Pig iron including cast iron	14,984	5,904	U.S.S.R. 3,832; United Kingdom 2,071.
Sponge iron, powder and shot	847	736	United Kingdom 553.
Ferromanganese	1,303	840	Netherlands 570.
Steel, primary forms	21,871	13,111	United Kingdom 6,333; West Germany 2,033.
Semimanufactures:			
Bars, rods, angles, shapes, sections	r 267,056	284,434	United Kingdom 116,632; West Germany 71,490; Belgium-Luxembourg 61,945.
Universals, plates, sheets	287,817	252,870	West Germany 123,670; United Kingdom 95,200.
Hoop and strip	10,657	9,954	United Kingdom 7,599; West Germany 1,149.
Wire	20,902	15,563	United Kingdom 6,357; Netherlands 4,944.
Tubes, pipes, fittings	157,395	139,494	United Kingdom 65,186; West Germany 19,500; Netherlands 15,542.
Castings and forgings, rough	3,453	5,328	Italy 2,617; United Kingdom 1,578.
Rails and accessories	16,255	12,172	United Kingdom 10,484.
Total	r 763,535	719,815	
Lead:			
Oxides	2,858	3,752	NA.
Metal including alloys, all forms	r 2,533	2,192	United Kingdom 2,070.
Magnesium metal including alloys, all forms	20	7	NA.
Manganese:			
Ore and concentrate	62	35	NA.
Oxides	736	795	NA.
Mercury ---------- 76-pound flasks	38	58	NA.
Molybdenum metal including alloys, all forms	2	2	NA.
Nickel:			
Ore and concentrate	--	9	NA.
Matte, speiss, similar materials	142	9	NA.
Metal including alloys:			
Scrap	3,054	--	
Unwrought and semimanufactures	1,082	372	United Kingdom 201; West Germany 74.
Platinum-group metals and silver, including alloys:			
Platinum group ---------- value, thousands	$388	$456	United Kingdom $426.
Silver ---------- do	$615	$775	United Kingdom $699.
Rare-earth metals, including alloys	23	16	NA.
Tin:			
Ore and concentrate	--	2	NA.
Oxides	36	334	NA.
Metal:			
Scrap	40	4	NA.
Unwrought and semimanufactures	65	74	United Kingdom 67.
Titanium oxides	4,160	3,671	NA.
Tungsten metal including alloys, all forms	(1)	3	NA.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Zinc:			
Oxides	1,032	1,085	NA.
Metal including alloys:			
Scrap	454	372	United Kingdom 314.
Unwrought	4,532	2,325	United Kingdom 1,551; Finland 248.
Semimanufactures	822	1,656	United Kingdom 979; Netherlands 220.
Other:			
Ore and concentrate	3,119	1,261	NA.
Ash and residue, containing nonferrous metals	2,276	429	NA.
Oxides, hydroxides, peroxides of metals, n.e.s	103	181	NA.
Base metals including alloys, all forms	138	145	NA.
NONMETALS			
Abrasives, natural:			
Crude, n.e.s ---- value, thousands	r $340	$357	United Kingdom $219.
Grinding and polishing wheels and stones	624	656	United Kingdom 421; West Germany 107.
Asbestos	3,717	7,610	Cyprus 1,777; Canada 1,524; Mozambique 1,480.
Barite and witherite	341	199	NA.
Boron materials:			
Crude natural borates	1,007	1,849	NA.
Oxide and acid	221	165	NA.
Cement	23,336	19,262	United Kingdom 16,726.
Chalk	9,262	6,192	NA.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	22,038	29,212	NA.
Products:			
Refractory (including nonclay bricks)	39,781	49,499	United Kingdom 47,058.
Nonrefractory	9,354	7,507	United Kingdom 6,198.
Diamond, all grades -- value, thousands	$5	$42	NA.
Feldspar and fluorspar	7,184	7,393	NA.
Fertilizer materials:			
Crude:			
Nitrogenous	22	24	NA.
Phosphatic	434,189	449,270	Morocco 433,408.
Potassic	265	2,775	France 2,767
Other	150	578	NA.
Manufactured:			
Nitrogenous	r 208,998	158,839	United Kingdom 70,890; Netherlands 57,603.
Phosphatic	333,781	271,417	Belgium-Luxembourg 169,373; Netherlands 55,304; United Kingdom 39,459.
Potassic	r 426,954	268,727	East Germany 65,150; France 61,715; West Germany 55,835.
Other	r 135,060	151,897	United Kingdom 93,606; Canada 27,547.
Ammonia	r 66,151	85,024	NA.
Graphite, natural	59	134	NA.
Gypsum and plasters	3,924	2,752	NA.
Lime	6,393	5,114	All from United Kingdom.
Magnesite	12,386	26,904	NA.
Mica:			
Crude, including splitting and waste	253	196	NA.
Worked	6	3	NA.
Pigments, mineral:			
Natural, crude	132	353	NA.
Iron oxides, processed	1,429	1,417	NA.
Precious and semiprecious stones, excluding diamond --- value, thousands	$265	$496	United Kingdom $204; India $164; Brazil $109.
Salt	59,610	63,950	United Kingdom 51,901; West Germany 10,135.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	10,453	11,815	NA.
Caustic potash, sodic and potassic peroxides	2,971	603	NA.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	1,434	1,713	NA.
Slate	747	947	NA.
Other	1,159	1,302	NA.

See footnotes at end of table.

Table 3.—Ireland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Stone, sand and gravel—Continued			
Dimension stone—Continued			
Worked:			
Slate	116	89	NA.
Paving and flagstone	(1)	8	NA.
Other	251	243	NA.
Dolomite	r 5,225	1,548	NA.
Gravel and crushed stone	143,886	209,554	NA.
Limestone (except dimension)	2,310	3,019	NA.
Quartz and quartzite	1,667	1,473	NA.
Sand, excluding metal bearing	r 86,695	100,992	NA.
Sulfur:			
Elemental:			
Colloidal	190	95	NA.
Other than colloidal	77,764	99,575	France 46,875; United States 22,530; Canada 10,609.
Sulfur dioxide	156	119	NA.
Sulfuric acid	r 57,186	57,092	NA.
Talc, steatite, soapstone, and pyrophyllite	2,172	2,422	NA.
Other:			
Crude nonmetals, n.e.s	r 6,521	6,131	NA.
Slag, dross, and similar waste, not metal bearing	1,922	709	NA.
Oxides and hydroxides of magnesium, strontium, barium	161	653	NA.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	6,099	9,510	United Kingdom 8,914.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	6,484	3,239	United Kingdom 2,175; Trinidad and Tobago 1,016.
Carbon black and gas carbon	7,593	7,821	NA.
Coal and briquets, anthracite and bituminous coal thousand tons	r 808	894	Poland 674; United Kingdom 135.
Coke and semicoke do	53	7	Mainly from United Kingdom.
Hydrogen and rare gases	2,139	1,089	NA.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	17,442	19,163	Iran 5,070; Kuwait 5,035.
Refinery products:			
Gasoline do	4,197	4,647	United Kingdom 4,162.
Kerosine do	r 2,429	1,847	All from United Kingdom.
Distillate fuel oil do	5,194	3,228	United Kingdom 3,117.
Residual fuel oil do	10,703	11,502	United Kingdom 8,052; U.S.S.R. 1,775.
Lubricants do	842	316	United Kingdom 306.
Other:			
Liquefied petroleum gas do	r 1,799	696	United Kingdom 695.
Mineral jelly and wax do	30	29	United Kingdom 22.
Nonlubricating oils, n.e.s do	r 218	87	NA.
Bitumen and other residues do	714	709	NA.
Bituminous mixtures, n.e.s do	49	43	NA.
Pitch and pitch coke do	4	2	NA.
Petroleum coke do	1	--	
Total do	r 26,180	23,106	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons	153	6	Mainly from United Kingdom.

r Revised. NA Not available.

1 Less than ½ unit.

COMMODITY REVIEW

METALS

Copper.—Copper production declined significantly in 1975 compared with 1974, as one mine ended production.

The open pit Gortdrum mine closed in August, sooner than originally expected, because of exhaustion of minable ore. The mine, located 5 kilometers north of the town of Tipperary, was owned by Irish Base Metals Ltd., which was in turn controlled by Northgate Exploration Ltd. of Toronto, Canada. Gortdrum was also a producer of silver and mercury during its operation, from 1967 to 1975. A stockpile remained at the mine after closing, consisting of about 1.5 million tons of low-grade ore containing impurities in the form of mercury, antimony, and arsenic.

The Avoca mine of Avoca Mines Ltd., a subsidiary of Avoca Mines Canada Ltd. of Toronto located 55 kilometers south of Dublin, was the largest copper producer in 1975, although its production was affected by lessened demand. Mill capacity in 1975 reached 4,000 tons per day, an increase of one-third. Avoca also was the source of Ireland's small pyrite production.

In addition to Gortdrum and Avoca, a small amount of copper was produced at the Tynagh lead-zinc mine, but the concentrates were low grade, with much arsenic and antimony impurities, and were stockpiled.

Lead-Zinc.—In February the Irish Government granted a 25-year mining lease to Tara Mines Ltd., controlled by Tara Exploration and Development Co. of Canada, for the exploitation of the lead-zinc-silver deposit at Navan, County Meath, some 50 kilometers northwest of Dublin. Under terms of the agreement the Government would receive a 25% shareholding free of charge with full voting and other rights; a royalty of 4.5% would be paid to the Government on mine profits; taxes at the normal company rate of 50% would be paid by Tara; Tara would pay an annual rent of £6,000 after 2 years and £35,000 per year in case of work stoppage; the lease would run for 25 years with a provision for extension; there would be a maximum extraction rate which should assure that the mine is in production for at least 20 years; Tara would surrender to the Government some mineral properties that it owned privately; provision was also made for supply of concentrates to an Irish zinc refinery to be established in the future; and the Government would appoint two directors to the Tara Board, or 25% of board membership, whichever is higher. Production at the rate of 470,000 tons per year of lead and zinc concentrates was due to start in 1977 after expenditure of an estimated $150 million.

The deposit at Navan was estimated to contain a total of 70 million tons of ore, according to supplementary information filed with the Toronto and New York stock exchanges in 1974, making it apparently the largest known lead-zinc deposit in Europe. The area north of the Blackwater River, controlled by Bula Ltd., reportedly contained 7.7 million tons of proven and 1.2 million tons of probable ore; the area south of the river, controlled by Tara Mines, contained 15.9 million tons of proven ore and 6.1 million tons of probable ore. The remaining 39.1 million tons were not classified as either proven or probable for North American stock exchange purposes.

Lead and zinc were produced in Ireland at two mines during 1975. Mogul of Ireland, Ltd., operated the larger of these mines at Silvermines, Tipperary, some 30 kilometers northeast of Limerick. The other was the Tynagh mine at Tynagh, Galway, 50 kilometers east of the town of Galway.

The construction of a smelter to process lead and zinc concentrates in Ireland was under consideration by the Government. The smelter would be supplied chiefly from the Navan-Bula deposit and would, therefore, presumably be located in the Dublin-Navan area.

Manganese.—Completion of a plant to produce electrolytic manganese dioxide from imported ore, under construction by Mitsui Denman (Ireland) Ltd., a subsidiary of Mitsui & Co., Ltd. of Japan, was not achieved in 1975 but was expected by 1976. The plant, constructed at a cost of £14 million on Little Island, near the city of Cork, was designed for an output of 12,000 tons per year.

Titanium.—DuPont relinquished its option on a tidewater site at Ringaskiddy, County Cork, and postponed indefinitely its plans to build a plant to produce 100,000 tons per year of titanium dioxide, an intermediate product. The company related the action to the European market situation.

NONMETALS

Barite.—Ireland's large barite production came from the Magcobar mine, owned by Magnet Cove Barium Corp. of Texas, located near the Silvermines lead-zinc mine in Tipperary. The product was ground and exported to the U.S. gulf coast through the port of Foynes near Limerick.

Cement.—Production of cement in 1975 continued to suffer from a lower level of construction activity. Three cement plants were operated by Cement Ltd. Two of these were near Drogheda, 45 kilometers north of Dublin; these were the original Drogheda plant, destined to be closed in 1977, and the new Platin plant, capacity 600,000 tons per year, due to be expanded to 1 million tons. A third plant, at Limerick, with capacity of 720,000 tons per year, served southern and western Ireland.

Fertilizer Materials.—A 1,350-ton-per-day ammonia plant and a 1,000-ton-per-day urea plant were to be built by 1978 by the Government-controlled Nitrigin Eireann Teoranta (NET, Irish Nitrogen, Ltd.) at Marino Point on Great Island in Cork Harbor. Natural gas for the plant will be supplied from the Kinsale Head Field, 43 kilometers offshore from the County Cork coast. In 1975 Ireland's only nitrogen-fixing facility was NET's small decade-old plant at Arklow on the coast, 65 kilometers south of Dublin, which had a capacity of 38,000 tons of ammonia per year, and was part of a fertilizer complex producing sulfuric acid (from Avoca pyrite), ammonium sulfate, nitric acid, calcium ammonium nitrate, phosphoric acid, and mixed fertilizers.

There was no production of potash or phosphate rock in Ireland.

MINERAL FUELS

Energy.—Production of energy in Ireland was confined to peat, plus a small amount of semibituminous coal; the latter contributed only 2% to 3% of the total energy output.

The first source of additional energy was expected to be the Kinsale Head offshore gasfield, which was to reach production by 1978. There was also hope that offshore sedimentary basins around Ireland would ultimately yield commercial quantities of petroleum, but results in 1975 were negative.

Table 4 presents the recent energy balance for Ireland; it shows that over 70% of energy consumption was supplied by imported petroleum (almost all of which was crude).

Table 4.—Ireland: Supply and apparent consumption of energy-producing materials for 1973 and 1974

(Million tons of standard coal equivalent)[1]

	Total Energy	Coal, coke and peat	Petroleum and refinery products	Hydro-electric power
1973:				
Production	2.1	2.0	--	0.1
Imports	9.2	.8	8.4	XX
Exports	1.3	.1	1.2	XX
Apparent consumption	10.0	2.7	[2]7.2	.1
1974:				
Production	2.1	2.0	--	.1
Imports	9.4	.9	8.5	XX
Exports	1.1	.1	1.0	XX
Apparent consumption	10.4	2.8	[2]7.5	.1

XX Not applicable.
[1] 1 ton standard coal equivalent (SCE) = 7,000,000 kilocalories.
[2] Includes refinery fuel and losses.

Source: United Nations. World Energy Supplies, 1950–74. Statistical Papers, Series J, No. 19, 1976.

Natural Gas.—A 20-year agreement was signed in July between the Bord Gais Eireann Teoranta (BGE, Irish Gas Board Ltd.) and Marathon Petroleum Ireland Ltd. for the supply of about 125 million cubic feet of natural gas per day from Marathon's Kinsale Head Field, some 43 kilometers off the coast of County Cork. First deliveries were expected in 1979. BGE will in turn sell the gas to two seminational bodies, the Electricity Supply Board (ESB) and NET, and a small amount to the city of Cork.

The Kinsale Head Field, discovered in 1971, was estimated by Marathon to contain reserves on the order of 1 trillion cubic feet of natural gas. Located under some 300 feet of water, it contains two producing sands located between 2,700 feet and 3,100 feet. Two platforms were to be installed, with seven wells to be drilled from each platform, and a 24-inch-diameter pipeline was to bring the gas onshore to a metering station near Powerhead Bay. Estimated development costs were £75 million.

All of the six wells completed in 1975 in the Marathon Celtic Sea concessions, four by Marathon and two by Esso, gave negative results.

Nuclear Energy.—Carnsore Point, County Wexford, the extreme southeastern point of Ireland, was selected by the ESB as the most suitable site for Ireland's first nuclear generating station. The tentative commissioning date was deferred until 1985 in view of a decline in the growth rate of electricity consumption. Although no firm decision was made to go ahead, preliminary design work and all legal and administrative steps were to be completed for a 600-megawatt plant.

Peat.—Peat was the main indigenous source of energy in Ireland; coal production was minor. Some 23% of the electrical energy generated in the year to March 31, 1975, was produced with peat fuel; this figure had declined from 28% in 1972.

Peat was produced by the Bord na Mona, the Irish Government peat board, at numerous locations, largely in central Ireland. Local production by farmers added to the total. A relatively small amount of peat was used in agriculture and gardening.

Petroleum.—Ireland had no indigenous production of petroleum. Exploration by Esso in the Celtic Basin off the south coast, adjacent to the area of Marathon's natural gas discovery, resulted in 1975 in two noncommercial oil strikes.

The only domestic refinery was that of the Irish Refining Co. Ltd. at Whitegate, in the harbor of the city of Cork, which had a throughput capacity of 54,000 barrels per calendar day of imported crude.

The Mineral Industry of Israel

By David E. Morse [1]

Exploitation of Israel's modest natural resources in 1975 included processing Dead Sea brines to produce potash, bromine, magnesium oxide, and salts, and mining phosphate rock, glass sand, various clay minerals, copper ore, building stone, sand, and gravel. The mining industry furnished the base for Israel's nonmetallic chemical industry. In 1975, reduced world demand for fertilizer materials caused the value of sales from phosphates and potash to decline. Copper mining recorded a large financial loss owing to low world prices in 1975. Petroleum exploration in Israel increased during 1975. Israel did not have a major domestic source of crude oil at yearend 1975 because control of the Abu Rodeis oilfield in the southwest Sinai was relinquished late in the year.

The slowdown in Israel's economic activity, which began in 1974, continued through 1975. In its first 25 years, Israel's gross national product (GNP) increased about 10% annually until 1975 when growth declined to less than 1%. The Government's series of austerity measures, begun late in 1974 to reduce inflationary pressure and safeguard foreign-exchange reserves, succeeded in lowering the inflation rate from 56% in 1974 to 23.5% in 1975. In June 1975, the Israeli pound (I£) was devaluated from I£6.00=US$1.00 to I£6.12=US$1.00. Successive devaluations followed during the rest of the year and by yearend the exchange rate was I£7.1=US$1.00.

PRODUCTION

Mining and quarrying accounted for 2.3% of total industrial output and 5.2% of total industrial exports in 1975, compared with 2.5% and 6.1%, respectively, in 1974. Declines in production took place in copper (20%), glass sand (11%), phosphates (unprocessed) (5%), and oil refinery products (3%). Bromine, dimension and crushed stone, gypsum, iron and steel, magnesium oxide, and salt production approximated 1974 levels. Potash, cement, flint clay, and kaolin production increased 26%, 22%, 52%, and 186%, respectively, during 1975 compared with 1974 outputs. The labor force in the mineral industries remained stable. Israel's production of mineral commodities is shown in table 1.

[1] Physical scientist, International Data and Analysis.

Table 1.—Israel: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Copper, cement (70%–80% Cu):			
Gross weight	13,252	[e] 12,500	[e] 10,000
Metal content	10,162	9,322	7,500
Iron and steel:			
Pig iron [e]	40,000	40,000	40,000
Crude steel [e]	110,000	120,000	120,000
NONMETALS			
Bromine:			
Elemental	13,040	18,000	18,000
Compounds	9,500	10,000	12,000
Cement, hydraulic ......thousand tons	1,258	1,796	2,189
Clays:			
Flint clay	15,000	44,000	67,059
Metabentonite	4,000	3,800	3,000
Kaolin	[e] 29,000	4,200	12,000
Other	2,000	1,200	2,000
Fertilizer materials:			
Crude:			
Phosphatic:			
Unprocessed ......thousand tons	1,537	2,442	2,326
Beneficiated ......do	781	1,026	882
Potassic:			
Gross weight (sales) ......do	878	921	1,159
K_2O equivalent ......do	535	562	707
Manufactured:			
Nitrogenous	138,101	122,022	176,557
Phosphatic (superphosphate)	198,900	220,100	246,100
Potassic	3,045	5,494	8,742
Gypsum	150,000	200,000	200,000
Lime	[e] 180,000	200,000	240,000
Salt, marketed (mainly marine)	[r] 95,864	112,756	114,947
Sand and gravel:			
Sand:			
Glass sand	69,500	83,500	74,000
Other (for building industry) ......thousand cubic meters	3,000	3,500	5,000
Gravel ......do	NA	500	NA
Sodium and potassium compounds, caustic soda	18,797	20,458	24,156
Stone:			
Dimension, marble	16,000	16,000	16,000
Crushed ......thousand cubic meters	11,000	14,000	14,000
Sulfur:			
Elemental	[e] 10,000	(2)	--
Sulfuric acid ......thousand tons	193	187	194
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural, marketed ......million cubic feet	1,907	2,327	2,105
Peat [e] ......thousand tons	20	20	20
Petroleum:			
Crude:			
From Israel proper ......thousand 42-gallon barrels	275	281	250
From occupied Sinai ......do	31,918	36,219	27,095
Refinery products:			
Gasoline ......do	8,246	8,644	7,768
Jet fuel ......do	3,608	4,536	4,334
Kerosine ......do	2,577	2,099	1,994
Distillate fuel oil ......do	9,277	10,111	12,130
Residual fuel oil ......do	21,646	21,998	19,456
Lubricants ......do	155	167	201
Other ......do	4,483	4,251	3,984
Refinery fuel and losses ......do	1,546	1,877	2,077
Total ......do	51,538	53,683	51,994

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

[1] In addition to the commodities listed, Israel reportedly has the capacity to produce 71 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.

[2] Revised to none.

TRADE

Israel's balance of trade was still highly unfavorable in 1975 when the deficit was $2.2 billion, but this represents a 9% reduction from the 1974 deficit of $2.44 billion.

Gross commodity exports increased $107

million to $1.93 billion in 1975. Overseas sales of polished diamond were valued at $548 million, and totaled over 2.7 million carats. The 1975 value dropped 2%, but the total carat sales increased 9.5% relative to 1974 sales because Israel's diamond industry emphasized the production of smaller stones (melees) to meet contemporary market demands. The United States and Hong Kong remained Israel's largest customers of polished diamond in 1975. Other major diamond importers included the Netherlands, Japan, Belgium, Switzerland, and West Germany.

Gross commodity imports declined 3% in 1975 and totaled $4.12 billion. The import value of fuels increased 7.6% over the 1974 value to $650 million in 1975.

Exports and imports of mineral commodities for 1973 and 1974 are shown in tables 2 and 3.

Table 2.—Israel: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [1]	Principal destinations, 1974
METALS			
Aluminum metal including alloys, all forms	r 2,401	1,976	Belgium-Luxembourg 383; West Germany 154; Netherlands 123.
Copper:			
Copper cement	11,621	12,512	Spain 5,659; Taiwan 3,986; United Kingdom 1,531.
Matte [2]	2,070	1,981	West Germany 881; Netherlands 267; Italy 204.
Metal including alloys:			
Scrap [3]	r 111	194	United States 102; Belgium-Luxembourg 92.
Unwrought and semimanufactures	456	1,054	Spain 701; Iran 170.
Iron and steel metal including alloys, all forms [4]	10,509	16,227	Romania 6,297; United States 5,226.
Lead metal including alloys, all forms	147	231	Italy 201; Netherlands 30.
Nickel metal including alloys, all forms	9	24	All to West Germany.
Zinc oxide	557	--	
Other:			
Ash and residue containing nonferrous metals	386	312	Netherlands 171; Belgium-Luxembourg 104.
Metals including alloys, all forms value, thousands	$37	$111	Republic of South Africa $64; Switzerland $23.
NONMETALS			
Abrasives, natural, n.e.s., grinding and polishing wheels and stones value	$58,000	$159,000	Canada $51,000; Turkey $44,000.
Barite and witherite	r 214	445	Republic of South Africa 425.
Bromine [5]	1,290	1,846	Argentina 321; United States 313; West Germany 249.
Clays and clay products, including all refractory brick:			
Crude clays, n.e.s	r 2,110	12,151	Netherlands 3,861; West Germany 2,884.
Products:			
Refractory, (including nonclay bricks)	2,283	816	Iran 463; Greece 315.
Nonrefractory value	$14,000	$166,000	West Germany $57,000; United States $47,000.
Diamond, gem, not set or strung [6] thousand carats	r 2,679	2,766	United States 838; Hong Kong 490; Belgium-Luxembourg 296.
Fertilizer materials:			
Crude phosphatic	303,442	421,650	Belgium-Luxembourg 120,416; Romania 100,675; Austria 86,493.
Manufactured:			
Nitrogenous	--	[7] 3,812	Belgium-Luxembourg 1,500; United States 842; Uruguay 700.
Phosphatic	243,581	344,979	Norway 61,794; Austria 59,634; Yugoslavia 35,953.
Potassic value	$136,000	$499,000	Greece $256,000; Cyprus $128,000; Argentina $110,000.
Other, including mixed	r 774,130	676,817	France 111,709; Italy 103,355; United States 96,545.
Ammonia	28	4,684	Italy 4,250.
Lime	82	130	All to Ethiopia.
Magnesite value, thousands	$214	$2,880	Austria $2,352.

See footnotes at end of table.

Table 2.—Israel: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [1]	Principal destinations, 1974
NONMETALS—Continued			
Precious and semiprecious stones, except diamond ---do---	$4,220	$4,383	Switzerland $1,515; United States $1,165.
Salt	[r] 108	20	All to United States.
Stone, dimension, all types	16	1,361	West Germany 936; Netherlands 352.
Sulfur:			
Elemental, all forms	40	41	Taiwan 30; Cyprus 11.
Sulfuric acid	92	196	Ethiopia 119; Kenya 77.
Other nonmetals, n.e.s.:			
Crude	[r] 189	325	France 147; Netherlands 85.
Slag and ash	230	76	Netherlands 48; West Germany 28.
Bromine, chlorine, fluorine, iodine	5,532	6,056	United Kingdom 1,395; West Germany 1,237; Hungary 607.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	239	5	NA.
Carbon black	4,889	4,703	Thailand 2,790; Turkey 1,211.
Hydrogen, helium, rare gases	3	4	All to Iran.
Petroleum: [e] [8]			
Crude and partly refined thousand 42-gallon barrels	26,470	35,611	NA.
Refinery products:			
Gasoline ---do---	890	1,256	NA.
Kerosine ---do---	298	310	NA.
Jet fuel ---do---	410	445	NA.
Distillate fuel oil ---do---	1,615	1,750	NA.
Residual fuel oil ---do---	2,222	1,920	NA.
Other	780	1,477	NA.
Total ---do---	6,215	7,158	NA.

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

[1] Data for 1973 and 1974 may be incomplete. Unless otherwise specified, the figures presented 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 was provided. In some cases, where it is clear that a significant portion was exported for which no quantity figure was provided, the value figure has been provided in a footnote.

[2] Totals exclude quantities valued at $963,000 in 1973 and $6,000 in 1974.

[3] Totals exclude quantities valued at $79,000 in 1973 and $346,000 in 1974.

[4] Totals exclude quantities valued at $141,000 in 1973 and $1,800,000 in 1974.

[5] Elemental bromine is included with chlorine, fluorine, and iodine, and is reported in this grouping under "Other nonmetals" in this table.

[6] Totals exclude quantities valued at $252,000 in 1973 and $195,000 in 1974.

[7] Total excludes quantity valued at $542,000.

[8] Bureau of Mines International Petroleum Annuals, 1973 and 1974, published in March 1974 and March 1975, respectively.

Table 3.—Israel: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [1]
METALS		
Aluminum:		
Bauxite and concentrate	301	458
Oxide and hydroxide	708	536
Metal including alloys, all forms	[r] 9,972	5,431
Chromium oxide, hydroxide, trioxide	[r] 40	33
Cobalt oxide and hydroxide	20	--
Copper:		
Matte	59	172
Metal including alloys, all forms	[r] 3,754	3,733
Gold metal, unworked or partly worked ---value, thousands---	[r] $13,338	$19,240
Iron and steel metal:		
Scrap	207	18,260
Pig iron, ferroalloys, similar materials	[r] 11,295	7,889
Steel, primary forms	[r] 62,186	73,063
Semimanufactures: [2]		
Bars, rods, angles, shapes, sections	[r] 245,678	243,873
Universals, plates, sheets	[r] 220,944	283,075
Hoop and strip	[r] 3,304	4,449
Rails and accessories	[r] 351	1,134
Wire	12,209	10,985
Tubes, pipes, fittings	[r] 7,104	6,342
High-carbon and alloy steel shapes, not further described	[r] 2,396	1,066

See footnotes at end of table.

Table 3.—Israel: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [1]
METALS—Continued		
Lead:		
Oxides	r 781	117
Metal including alloys, all forms	r 1,895	1,504
Magnesium metal including alloys, all forms [3]	130	33
Manganese oxides	r 421	[4] 195
Mercury ... value, thousands	$219	$131
Nickel metal including alloys, all forms	r 66	43
Platinum-group metals including alloys, all forms ... troy ounces	r 3,344	1,800
Rare-earth metals, compounds ... do	193	--
Silver metal including alloys, all forms ... do	r 244,924	[5] 106,547
Tin:		
Oxides ... value, thousands	$18	--
Metal including alloys, all forms [6]	r 51	2,555
Titanium oxides	r 1,658	655
Zinc:		
Oxides	r 374	182
Metal including alloys, all forms	r 3,539	2,027
Other:		
Ore and concentrate, n.e.s	r 67	191
Oxides, hydroxides, peroxides of metals, n.e.s	83	37
Metals including alloys: Alkali and rare-earth metals ... value	$8,000	--
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	r 157	9,832
Corundum, artificial	95	89
Grinding and polishing wheels and stones ... value, thousands	r $449	$649
Asbestos	r 5,182	8,099
Barite and witherite ... value, thousands	$34	$53
Boron materials, oxide and acid	r 162	5
Cement	r 317,085	459,576
Chalk	153	80
Clays and clay products (including all refractory brick):		
Crude clays, andalusite, kyanite, etc	r 11,552	7,006
Products:		
Refractory (including nonclay bricks)	r 1,539	[7] 1,252
Nonrefractory ... value, thousands	r $4,596	$5,713
Diamond:		
Gem, not set or strung ... thousand carats	7,238	6,120
Worked:		
Industrial ... do	r 1,488	1,486
Other ... value, thousands	$19,359	$16,504
Diatomite and other infusoral earth	r 570	388
Feldspar and fluorspar	r 1,749	2,867
Fertilizer materials:		
Crude, phosphatic	--	30
Manufactured:		
Nitrogenous ... value, thousands	$29,781	$6,548
Other, including mixed ... do	$32	$178
Ammonia ... do	$49	--
Graphite, natural	13	38
Gypsum and plasters	161	146
Magnesite	1,179	[8] 556
Mica, crude, including splittings and waste	r 34	29
Pigments, mineral:		
Natural crude ... value, thousands	$22	--
Iron oxides, processed	183	128
Precious and semiprecious stones, except diamond:		
Natural ... value, thousands	r $3,375	$5,105
Manufactured, including synthetic ... do	$359	$277
Salt ... do	$33	--
Sodium and potassium compounds, n.e.s	r 1,172	385
Stone, and sand and gravel:		
Dimension stone:		
Crude and partly worked, calcareous	r 1,233	292
Worked ... value, thousands	$123	$350
Gravel and crushed rock	r 6,149	7,984
Quartz and quartzite	493	388
Sand, excluding metal-bearing	30	--
Sulfur:		
Elemental, all forms	r 16,017	41,544
Sulfuric acid ... value, thousands	$805	$1,949
Talc, steatite, soapstone, pyrophyllite	r 682	1,262

See footnotes at end of table.

Table 3.—Israel: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [1]
NONMETALS—Continued		
Other nonmetals, n.e.s.:		
Crude mineral substances, n.e.s	r 445	526
Oxides and hydroxides of magnesium, strontium, barium	r 53	28
Bromine, iodine, fluorine	5	--
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	106	20
Unspecified	37	35
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural value, thousands	$22	--
Carbon black	r 461	165
Coal, all grades	r 3,136	340
Coke and semicoke	[9] 10	1,010
Gas, hydrocarbon, manufactured	8	--
Peat, including peat briquets and litter	86	6
Rare gases (argon)	24	33
Petroleum: e		
Crude and partly refined thousand 42-gallon barrels	46,500	55,820
Refinery products:		
Gasoline (including natural):		
Aviation do	46	130
Motor do	682	565
Kerosine do	670	520
Jet fuel do	824	1,220
Distillate fuel oil do	442	335
Residual fuel oil do	122	--
Lubricants do	308	775
Other do	560	844
Total	3,654	4,389
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 1,177	569

e Estimate. r Revised.

[1] Data for 1973 and 1974 may be incomplete. Unless otherwise specified, the figures presented 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 was provided. In cases where a significant portion of the total can be accounted for only in terms of value, a separate footnote is provided to indicate such.

[2] Excludes quantities valued at $5,862,000 in 1973 and $8,059,000 in 1974.

[3] Excludes quantities valued at $6,000 in 1973 and $561,000 in 1974.

[4] Excludes quantity valued at $395,000.

[5] Excludes quantity valued at $2,501,000.

[6] Excludes quantities valued at $23,000 in 1973 and $552,000 in 1974.

[7] Excludes quantity valued at $545,000.

[8] Excludes quantity valued at $200,000.

[9] Excludes quantity valued at $456,000.

COMMODITY REVIEW

METALS

Copper.—Timna Copper Mines Ltd. produced about 10,000 tons of cement copper (70%–80% Cu content) in 1975, a 20% drop from 1974 production. The Timna mining complex is located in southern Israel 20 kilometers north of the Gulf of Agaba port of Eilat. The depressed world copper price and increased production costs severely affected the viability of the copper operation, and temporary closure was being seriously considered.[2] The low copper content of the ore and the increased cost of imported sulfur used in producing cement copper were major contributors to the high production costs. In addition, Timna's cement copper did not contain extra revenue-producing elements such as gold or silver. Reserves at the company's open pit and underground works were estimated at 14 million tons of oxide zone copper ore with a copper content of 1.1% to 1.3%. Most of the 1975 cement copper production was exported.

Iron Ore.—Surveys conducted during the mid-1950's at Har Ramin, near Manara in the Upper Galilee, indicated 40 million tons of ore containing 27% Fe. New beneficiation processes developed by Israel Mining Industries and existing processes could be used to enrich the ore to 64% to 66% Fe. Approximately 6 million tons of iron ore could be produced from the Har Ramin deposits, thus significantly reducing Israel's scrap iron imports. The decision to

[2] U.S. Embassy, Tel Aviv, Israel. State Department Airgram A-182, Oct. 15, 1975, 6 pp.

develop the iron ore deposits at Har Ramin has not been reported.[3]

Magnesium.—Dead Sea Periclase Co. Ltd. manufactured periclase—high-purity magnesium oxide (MgO)—from the Dead Sea Works Ltd.'s waste brines, which were pumped by pipeline to the plant on the Rotem Plain above the Dead Sea. The plant's capacity was rated at 50,000 tons per year of MgO, but technical difficulties encountered since initial startup kept 1975 output to about 20,000 tons. During the year, nearly 43,000 tons of hydrochloric acid were produced as a byproduct and were shipped to the adjacent phosphoric acid plant run by Arad Chemical Industries Ltd. The MgO was used as a raw material in the manufacture of refractory brick as well as in the ceramic, electrical, chemical, and rubber industries. It was planned to increase the plant's capacity to 100,000 tons per year by 1980 with an additional investment of over $40 million. About 75% of the 1975 production was exported.

NONMETALS

Bromine.—Dead Sea Bromine Ltd. produced 18,000 tons of bromine and about 4,000 tons of ethylene dibromide during 1975. The company, a subsidiary of Dead Sea Works Ltd., used chlorine and the residual brines from potash extraction at the adjacent Dead Sea Works as raw materials to produce liquid bromine. Expansion was underway in 1975 to increase annual production capacity to 50,000 tons of bromine by yearend 1978. A portion of the bromine output was shipped to a sister company, Bromine Compounds Ltd. at Be'er Sheva, for the manufacture of ethyl bromide, sodium bromide, potassium bromide, and ammonium bromide, which were utilized by fertilizer and pharmaceutical industries. Bromine Compounds planned to begin production in a new plant south of Be'er Sheva in 1978. The new plant was designed to process 20,000 tons per year of raw bromine. The Government approved plans for the construction of a chlorine plant at the Dead Sea Works during 1975. When completed in 1978, the plant was to produce 33,000 tons of chlorine per year.

Cement.—Nesher Cement Co. Ltd., Israel's only cement producer, operated plants at Haifa, Ramale, and Bet Shemesh. Output increased 24% above that of 1974 to 2.2 million tons in 1975. Production in 1975 almost met domestic demand, and the company reduced its imports of cement from 325,000 tons in 1974 to 100,000 tons in 1975.

Clays and Sand.—Israel's requirements for industrial sands and clays were supplied by Negev Ceramics Ltd., which produced about 160,000 tons of quartz sand and several different types of clays during 1975. Nearly pure quartz sand and various clays were mined from the Great Crater near Yeruhan. Flint clays were mined and processed in the Ramon Crater. Both areas are located in the Negev desert of the southern district.

Fertilizer Materials.—*Phosphate.*—Israel's phosphate reserves in the Negev were estimated at about 300 million tons in over 20 known deposits in 1975. Phosphate production by Negev Phosphate Co. Ltd. from the Orin and Little Crater mines was approximately 900,000 tons (30% to 34% P_2O_5), a 10% decline from 1974 production. The decline was due to lower world phosphate demand in 1975. Planned development of phosphate mining in the Zin Valley by Negev Phosphate called for an investment of nearly $70 million. Mining operations were to begin in early 1978, and a production level of 1 million tons per year attained by 1980.

Early in 1975, Arad Chemical Industries, which operated a phosphoric acid plant on the Rotem Plain and a phosphate mine at Hazeva, was merged into Negev Phosphate Co. Arad had been operating at a loss since its establishment in 1964 because of repeated technical difficulties in the design of the fluid-bed reactors that used Dead Sea Works waste brines to produce hydrochloric acid. Arad operated the phosphoric acid end of its plant using hydrochloric acid from the adjacent Dead Sea Periclase Co., and the output of one of its fluidized-bed reactors operating at reduced capacity. The 1975 production of 19,500 tons of phosphoric acid was still well below the plant's designed 166,000-ton-per-year capacity. The Hazeva mine had an output of 215,000 tons of crude phosphate rock, for use at the phosphoric acid plant.

Potassium.—Dead Sea Works, located near the southern end of the Dead Sea, extracted over 1.1 million tons of potas-

[3] The Israel Economist. V. 31, No. 5–6, May–June 1975, p. 95.

sium chloride (KCl) from the waters of the Dead Sea in 1975. The hydrated double salt, carnallite ($KCl \cdot MgCl_2 \cdot 6H_2O$), was recovered from diked ponds by dredgers and split into KCl and various brines. The KCl was either sold directly or converted into potassium sulfate or potassium nitrate. Dead Sea Works also produced 100,000 tons of industrial and table salts. In 1975, expansion was underway to increase the annual production capacity to 1.5 million tons of KCl. About 90% of the Dead Sea Works products were exported in 1975.

Production of potassium nitrate by Haifa Chemicals Ltd. in its 110,000-ton-per-year plant at Haifa was over 100,000 tons in 1975. Installation of a second 110,000-ton-per-year plant, to be completed by late 1976, was expected to double potassium nitrate capacity. Haifa Chemicals was the world's largest producer of potassium fertilizer.[4] Over 90% of Haifa's 1975 potassium nitrate output, manufactured from domestic raw materials, was exported. Fertilizers and Chemicals Co., based in Haifa, specialized in the manufacture of fertilizers and fodder additives. The bulk of this concern's products, processed from domestic and imported minerals, was sold in the local market and supplied most of Israel's fertilizer needs. Production figures for 1975 were not available; however, sales for fiscal year ending March 31, 1975, totaled over $41 million, and export sales for the same period were $8.7 million.[5]

MINERAL FUELS

Petroleum.—The Paz Oil Co. Ltd. held exploration permits for 375 square miles along Israel's west coast and 50 square miles southwest of the Dead Sea. Oil Exploration Ltd. held permits for a 135-square-mile area near the west Negev and a 95-square-mile area in the Dead Sea. Lapidoth Israel Oil Prospectors, Inc., an agent of the Government, carried out oil prospecting and exploration in Israel, along Israel's Mediterranean shelf and in the Gulf of Suez. Petroleum exploration increased in 1975 when nine test wells were drilled, all dry. The Government announced plans to spend about $35 million per year for oil exploration during the 4 years ending March 1980.[6]

At the end of November 1975, Israel relinquished control of the Abu Rodeis oilfield near the Gulf of Suez in the southwest Sinai. The 90 producing wells in the oilfield supplied over 50% of Israel's 1975 crude oil needs. Oil production from Israel's only remaining field, the 20-year-old Helez oilfield, dropped to under 700 barrels per day and supplied less than 1% of Israel's total crude oil demand.

The Eilat-Ashkelon oil pipeline carried about 22 million tons of crude oil in 1975 compared with 25.5 million tons in 1974.[7] Drilling began in 1975 on an underground storage facility near Eilat capable of holding 8 million tons of crude oil.[8] In 1975, petroleum refinery throughput dropped slightly to 52 million barrels owing to increased crude oil import prices and decreased consumption. Israel's petroleum refinery capacity was 10 million tons per year in 1975: 6.5 million tons at Haifa, and 3.5 million tons at Ashdod. An additional 3.5-million-ton-per-year unit was planned for the Haifa refinery; its startup was scheduled for late 1980.

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[4] Work cited in footnote 3.
[5] Enclosure 1 of work cited in footnote 2.
[6] The Israel Economist. V. 31, No. 12–13, December 1975–January 1976, p. 225.
[7] Page 223 of work cited in footnote 6.
[8] Petroleum Economist. V. 42, No. 8, August 1975, p. 34.

The Mineral Industry of Italy

By Roman V. Sondermayer [1]

During 1975 Italy was an important processor of raw minerals and crude oil, and a producer of metals, petroleum refinery products, and ornamental stone. Although the mining production of Italy ranked third in value among those of the members of the European Economic Community (EEC), the country was relatively deficient in basic industrial raw materials. The major minerals produced in Italy, with production expressed in percentages of world output, during 1972–75 were as follows: Pumice, 29% to 30%; mercury, 11% to 12%; feldspar, 7% to 8%; cement, gypsum, pyrite, and fluorspar, 5% to 6%; barite, asbestos, diatomite, steel, and zinc, 3% to 4%. However, during 1975 production and foreign trade in minerals continued to decline because of difficult economic conditions at home and abroad. Out of a gross national product (GNP) of about $172.6 billion in 1975, the mineral industry generated about 11%. Unemployment averaged 3.3%, and the consumer price index increased 11.4%.

There were several significant events in the mineral industry of Italy during 1975. Construction continued on a 100,000-ton-per-year copper rod plant; production of manganese ceased; discovery of new mercury and uranium reserves was announced; a pyrite mine was closed; preliminary work started on a new pyrite deposit; construction started on a new titanium mine and concentrator (first in Italy); deep drilling for gas continued in the Po Valley; and a plan for intensive construction of nuclear powerplants was made public.

The Government of Italy, through the Direzione Generale delle Minière, published a report entitled Relazione Generale Mineraria (General Report on Mining), which was an assessment of possibilities for increased output of minerals in the country by regions with projections of relative self-sufficiency of the country in 1980. During 1975 the number of new concessions for mining declined to 10 from 17 in 1974. However, the number of exploration permits increased from 161 in 1974 to 272 in 1975. The largest number of new permits was granted for exploration for sulfides of lead, zinc, copper, and iron.

PRODUCTION

During 1975 trends in mineral production continued to decline (7.5% when compared with the index for 1974), reflecting both the general slowdown of Italy's economy and less than stable political conditions. Table 1 shows the latest data on production.

[1] Physical scientist, International Data and Analysis.

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

Commodity	1973	1974	1975 [p]
METALS			
Aluminum:			
Bauxite	49,951	31,640	32,165
Alumina	[r] 486,329	568,756	[e] 700,000
Metal:			
Primary	184,179	212,225	190,070
Secondary	192,000	209,000	151,000
Antimony:			
Mine output, metal content	1,358	1,176	1,010
Regulus	1,277	1,171	1,444
Cadmium, smelter output	397	529	409
Copper:			
Mine output, metal content	858	1,073	917
Metal, secondary only	12,200	13,700	13,200
Germanium	52	56	NA
Iron and steel:			
Iron ore and concentrate [1] thousand tons	[r] 510	593	540
Pig iron do	10,033	11,686	11,350
Ferroalloys:			
Blast furnace do	65	75	61
Electric furnace do	173	174	180
Crude steel do	20,995	23,803	21,836
Steel, semimanufactures:			
Hot rolled:			
Wire rod do	1,168	1,334	1,113
Sections do	6,457	7,028	6,291
Plates and sheets do	7,521	8,323	7,603
Hoop and strip do	1,051	1,154	630
Railway track material do	173	150	199
Ingots, semimanufacturing and solid for tubes do	1,075	1,163	--
Other do	911	939	1,484
Total hot-rolled do	18,356	20,091	17,320
Castings and forgings do	293	417	424
Cold-rolled sheet do	3,910	3,986	3,265
Seamless tubes do	836	900	851
Lead:			
Mine output, metal content	25,900	22,700	26,800
Metal:			
Primary	35,127	43,460	33,197
Secondary	[r] 65,300	68,300	56,800
Magnesium metal, primary	8,936	9,180	7,485
Manganese:			
Mine output, gross weight	[r] 25,469	14,008	--
Mine output, metal content	[r] 7,100	4,200	--
Mercury metal 76-pound flasks	32,692	25,991	31,677
Silicon, elemental	21,070	16,190	14,100
Silver metal thousand troy ounces	1,349	1,344	1,169
Zinc:			
Mine output, metal content	78,600	77,600	74,307
Metal, primary	182,011	196,419	179,133
NONMETALS			
Asbestos	150,256	148,099	146,980
Barite	167,759	180,470	212,868
Cement, hydraulic thousand tons	[r 2] 36,365	36,309	34,235
Clays, crude:			
Bentonite do	[r] 299	344	280
Refractory (excluding kaolinitic earth) do	[r] 282	353	251
For cement do	4,316	NA	NA
For brick and terra cotta do	29,240	NA	NA
Fuller's earth do	114	105	70
Kaolin do	72	90	78
Kaolinitic earth do	22	23	28
Diatomite	87,170	[e] 90,000	[e] 90,000
Feldspar	189,322	238,684	185,209
Fertilizer materials:			
Crude potassium salts, natural thousand tons	[r] 1,791	1,944	1,834
Manufactured, gross weight:			
Nitrogenous do	[r] 3,183	3,174	3,029
Phosphatic do	1,132	1,138	782
Potassic do	258	291	282
Mixed and unspecified do	[r] 1,809	1,867	1,910
Fluorspar, all grades	235,086	248,491	231,253
Graphite, all grades	4,161	2,530	1,492
Gypsum (except dimension stone use) thousand tons	3,862	[r e] 3,900	[e] 3,900
Lime (quicklime and hydrated) do	2,248	2,320	2,185

See footnotes at end of table.

Table 1.—Italy: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Pigments, natural, crude	1,640	NA	NA
Pumice and related materials:			
Pumice and pumiceous lapilli ____ thousand tons	1,129	r e 1,130	e 1,130
Pozzolan ____ do	4,564	r e 4,600	e 4,600
Pyrite, all kinds:			
Gross weight ____ do	1,181	1,168	962
Sulfur content ____ do	r 520	502	414
Salt:			
Marine, crude ____ do	1,165	888	1,220
Other, including brine ____ do	3,707	4,006	3,191
Sand and gravel:			
Calcareous sand ____ do	e 2,300	NA	NA
Silica sand ____ do	6,044	NA	NA
Volcanic sand ____ do	154	NA	NA
Other sand and gravel ____ do	106,671	NA	NA
Stone:			
Dimension stone:			
Calcareous:			
Alabaster and onyx ____ do	11	NA	NA
Gypsum for cutting ____ do	24	NA	NA
Limestone ____ do	554	NA	NA
Marble in blocks:			
White ____ do	928	1,325	1,171
Colored ____ do	1,126		
Schist ____ do	17	NA	NA
Travertine ____ do	470	NA	NA
Tufa ____ do	1,614	NA	NA
Other:			
Diorite ____ do	6	NA	NA
Gneiss ____ do	222	NA	NA
Granite ____ do	39	NA	NA
Lava, basalt and trachyte ____ do	156	NA	NA
Porphyry ____ do	225	NA	NA
Quartz and quartzite ____ do	13	NA	NA
Sandstone ____ do	402	NA	NA
Serpentine ____ do	541	NA	NA
Slate ____ do	87	NA	NA
Syenite ____ do	--	NA	NA
Tuff, volcanic ____ do	632	NA	NA
Crushed and broken:			
Calcareous tufa ____ do	4,406	NA	NA
Diabase ____ do	161	NA	NA
Diorite ____ do	11	NA	NA
Dolomite ____ do	1,337	NA	NA
Gneiss ____ do	49	NA	NA
Granite ____ do	312	NA	NA
Lava ____ do	4,348	NA	NA
Limestone and dolomite:			
For construction ____ do	12,071	NA	NA
For lime and artificial cement ____ do	32,436	NA	NA
For hydraulic lime ____ do	767	NA	NA
For other ____ do	42,760	NA	NA
Total ____ do	88,034	NA	NA
Marble, white and colored ____ do	1,517	NA	NA
Marl for cement ____ do	7,982	8,761	NA
Porphyry ____ do	138	NA	NA
Quartz and quartzite ____ do	502	NA	NA
Sandstone ____ do	716	NA	NA
Schist ____ do	52	NA	NA
Serpentine ____ do	2,119	NA	NA
Travertine ____ do	251	NA	NA
Tuff, volcanic ____ do	2,014	NA	NA
Strontium minerals	735	750	e 720
Sulfur, native:			
Ore	778,037	473,301	500,296
Concentrate and filtrate (85% to 90% sulfur)	70,132	64,868	43,967
Fused in briquets	30,383	16,326	20,227
Talc and related materials	147,062	154,962	142,991
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bituminous rock, natural:			
For distillation	70,414	36,919	57,099
For paving	103,333	105,697	103,988
Carbon black	146,796	151,544	136,381
Coal:			
Subbituminous (sulcis coal) ____ thousand tons	5	4	2
Lignite ____ do	2,151	1,960	2,050

See footnotes at end of table.

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

Commodity	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coke, metallurgical ---- thousand tons --	7,665	8,566	8,115
Gas, natural, marketed production -- million cubic feet --	r 540,993	540,364	514,252
Natural gas liquids, natural gasoline thousand 42-gallon barrels --	539	585	408
Petroleum:			
Crude ---- do ----	7,082	6,976	6,934
Refinery products:			
Gasoline:			
Aviation ---- do ----	769	788	571
Motor ---- do ----	128,263	124,959	119,136
Jet fuel ---- do ----	16,711	14,388	11,202
Kerosine ---- do ----	34,768	30,727	23,161
Distillate fuel oil ---- do ----	r 227,260	223,038	179,659
Residual fuel oil ---- do ----	380,950	341,046	282,428
Lubricants ---- do ----	3,455	4,524	3,694
Other:			
Refinery gas ---- do ----	3,996	4,761	3,193
Liquefied petroleum gas ---- do ----	26,435	25,898	25,071
Naphtha ---- do ----	80,051	72,203	48,159
Paraffin ---- do ----	98	50	47
Bitumen ---- do ----	13,720	11,035	10,696
Unspecified ---- do ----	r 1,306	2,224	1,532
Partly refined oil ---- do ----	35,027	31,615	27,655
Refinery fuel and losses ---- do ----	51,942	48,820	43,628
Total ---- do ----	r 1,004,751	936,076	779,832

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Excludes pelletized iron oxide derived from pyrite.
[2] Includes 53,820 tons of natural cement.

TRADE

The downward trend in foreign trade of Italy continued during 1975. Decreased imports and exports of mineral commodities reflected economic difficulties in the country and abroad. As in the past, Italy depended heavily on imports of high-rank coals, liquid and gaseous hydrocarbon, and metals, ores, and concentrates. Principal trading partners remained EEC countries, the United States, and oil-producing countries in the Middle East. Tables 2 and 3 show details of Italy's foreign trade for 1974, the latest year for which complete data were available.

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

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite ----	r 3,777	5,256	NA.
Oxide and hydroxide ----	122,121	252,645	Netherlands 157,537; U.S.S.R. 76,710.
Ash and residue containing aluminum ----	8,317	3,275	France 1,745.
Metal including alloys:			
Scrap ----	r 722	734	France 611.
Unwrought ----	14,122	23,327	West Germany 6,137; France 5,202.
Semimanufactures ----	55,570	61,400	France 17,285; West Germany 6.780.
Antimony metal, all forms, including waste and scrap ----	r 419	717	France 219; United States 177; West Germany 156.
Arsenic:			
Natural sulfides ----	10	1	NA.
Trioxide, pentoxide, and acids ----	(1)	70	NA.
Beryllium oxide and hydroxide ----	r 2	--	
Bismuth, metal ----	r 50	31	Netherlands 9.
Cadmium metal including alloys, all forms ----	16	51	West Germany 40.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Chromium:			
Chromite	1,303	1,595	NA.
Oxide and hydroxide	2,010	319	Turkey 40; Sweden 38.
Metal including alloys, all forms	3	7	NA.
Cobalt:			
Oxide and hydroxide	1	26	NA.
Metal including alloys, all forms	2	11	NA.
Columbium and tantalum:			
Ore and concentrate	63	70	All to West Germany.
Metal, all forms, including waste and scrap	r 10	4	NA.
Copper:			
Ore and concentrate	6,564	4,032	Spain 2,859; Belgium-Luxembourg 488.
Matte	675	937	Belgium-Luxembourg 488; Austria 365.
Ash and residue containing copper	10,622	5,781	West Germany 3,642; Belgium-Luxembourg 1,242.
Copper sulfate	146	161	NA.
Metal including alloys:			
Scrap	2,630	4,882	United Kingdom 1,744; West Germany 1,684; France 574.
Unwrought	8,319	9,747	West Germany 4,253; Netherlands 2,183.
Semimanufactures	34,910	48,076	France 11,485; West Germany 8,157.
Gallium, indium, and thallium kilograms	r 1,035	52,000	Switzerland 47,500.
Germanium do	2,800	3,800	NA.
Iron and steel:			
Ore and concentrate	108	17,908	Belgium-Luxembourg 10,543; West Germany 5,286.
Roasted pyrite thousand tons	166	242	Austria 154.
Metal:			
Scrap do	10	11	West Germany 7; France 3.
Pig iron, including cast iron, spiegeleisen, powder and shot do	12	12	West Germany 5; Yugoslavia 3.
Ferroalloys do	24	28	NA.
Steel, primary forms do	226	447	Israel 74; Spain 62; Belgium-Luxembourg 58.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	1,424	2,050	Libya 316; U.S.S.R. 221.
Universals, plates, sheets do	812	809	United States 146; France 99; West Germany 94.
Hoop and strip do	62	85	France 15; Yugoslavia 10.
Rails and accessories do	23	29	Turkey 7; Switzerland 7; Brazil 5.
Wire do	23	49	Libya 7.
Tubes, pipes, fittings do	879	1,274	U.S.S.R. 499; United Kingdom 193.
Castings and forgings do	68	53	Yugoslavia 19.
Total do	3,291	4,349	
Lead:			
Ore and concentrate	12,056	12,529	Tunisia 5,210; Yugoslavia 2,092.
Ash and residue containing lead	773	3,996	France 2,689; Belgium-Luxembourg 1,176.
Oxide	8	429	Yugoslavia 427.
Metal including alloys:			
Scrap	44	43	NA.
Unwrought	r 1,857	1,577	Austria 760.
Semimanufactures	1,026	795	Libya 701.
Lithium	--	(1)	NA.
Magnesium metal, including alloys:			
Scrap	168	518	United States 218.
Unwrought	5,673	6,067	West Germany 4,874.
Semimanufactures	155	215	France 72.
Manganese:			
Ore and concentrate	r 40	82	NA.
Oxide and hydroxide	71	227	NA.
Metal all forms	4	129	NA.
Mercury 76-pound flasks	r 18,739	17,187	United Kingdom 4,798; East Germany 4,301.

See footnotes at end of table.

Table 2.—Italy: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Molybdenum metal including alloys, all forms ... kilograms	(2)	7,200	Poland 5,000.
Nickel:			
Matte, speiss and similar materials	2	297	Netherlands 281.
Metal including alloys:			
Unwrought	145	570	Netherlands 275; West Germany 194.
Semimanufactures	571	944	Spain 310; Netherlands 127.
Platinum-group metals and silver including alloys:			
Platinum group ... thousand troy ounces	r 333	62	West Germany 26; France 9.
Silver ... do	r 8,697	3,787	West Germany 1,247.
Rare-earth metals:			
Oxides and other compounds ... value	$18,398	$511	NA.
Metals, cerium	1	(1)	NA.
Selenium, elemental ... kilograms	20,100	1	NA.
Silicon, elemental	r 6,214	1,890	Brazil 600; West Germany 390.
Tellurium and arsenic	26	--	NA.
Thorium:			
Ore and concentrate ... kilograms	--	24	NA.
Thoria ... value	r $466	$3,312	NA.
Tin:			
Oxide	94	22	NA.
Metal, all forms	106	650	Netherlands 386.
Titanium:			
Ore and concentrate	r 4	34	NA.
Oxides	r 30,529	22,748	Poland 3,102; Hungary 2,702.
Metal including alloys, all forms	46	48	West Germany 26.
Tungsten metal including alloys, all forms	16	40	NA.
Vanadium oxide and hydroxide ... kilograms	--	5,200	NA.
Zinc:			
Ore and concentrate	28	15	NA.
Ash and residue containing zinc	7,071	7,515	West Germany 6,650.
Oxide	1,291	2,679	Romania 916; United States 318.
Metal including alloys:			
Scrap	--	137	NA.
Blue powder	169	649	Turkey 100.
Unwrought	5,132	22,532	United States 6,197.
Semimanufactures	r 1,047	1,010	France 269; Yugoslavia 168.
Zirconium:			
Ore and concentrate	147	80	NA.
Metal including alloys, all forms	(1)	2	NA.
Other:			
Ores and concentrates	44	38	West Germany 16.
Ash and residue containing nonferrous metals, n.e.s	5,566	4,679	West Germany 3,200.
Oxides and hydroxides	94	163	United States 46.
Metals including alloys, all forms:			
Metalloids n.e.s	78	2,745	Brazil 600; West Germany 390.
Alkali, alkaline earth, and rare-earth metals, n.e.s	98	140	NA.
Pyrophoric alloys	(1)	--	
Base metals including alloys, all forms, n.e.s	2	1	NA.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, corundum, etc	r 369,885	203,321	United States 80,305; United Kingdom 52,753.
Dust and powder of precious and semiprecious stones ... value	r $2,338	$4,644	NA.
Grinding and polishing wheels and stones	9,490	11,499	France 1,806; West Germany 1,459.
Asbestos	62,915	66,784	West Germany 25,421; France 14,515.
Barite and witherite	r 6,667	17,431	Netherlands 13,900.
Boron materials:			
Crude natural borates	r 25	146	NA.
Oxide and acid	r 3,757	4,064	West Germany 1,983; France 1,176.
Cement ... thousand tons	962	691	Libya 244; Israel 186; Yugoslavia 116.
Chalk	1,174	888	NA.
Clays and clay products (including all refractory brick):			
Crude n.e.s.:			
Bentonite	r 15,671	22,503	NA.
Kaolin	r 32,018	47,789	France 36,350.
Other	r 26,089	8,972	NA.

See footnotes at end of table.

Table 2.—Italy: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Clays and clay products (including all refractory brick)—Continued			
Products:			
Refractory (including nonclay bricks)	81,139	86,380	Argentina 16,066; West Germany 10,904; France 8,713.
Nonrefractory thousand tons	1,210	1,148	France 293; West Germany 212; Switzerland 134.
Cryolite and chiolite	11	1,517	Romania 1,011; Yugoslavia 308.
Diamond:			
Gem, not set or strung value, thousands	$80	$7	NA.
Industrial do	$90	$59	NA.
Diatomite and other infusorial earth	1,896	1,272	NA.
Feldspar	33,092	33,420	West Germany 12,647; Netherlands 3,369.
Fertilizer materials:			
Crude	6,205	7,990	France 5,783; Libya 1,550.
Manufactured:			
Nitrogenous thousand tons	1,040	1,349	Egypt 322; India 191; Turkey 190.
Phosphatic do	19	6	Indonesia 5.
Potassic do	26	29	Algeria 19.
Other do	199	286	Turkey 83; India 38; United States 31.
Ammonia	17,350	33,714	Greece 23,995.
Fluorspar	r 91,053	75,511	United States 37,386; West Germany 23,271.
Graphite, natural	2,295	2,673	France 1,762.
Gypsum and plasters	20,798	26,287	NA.
Lime	r 88,698	134,980	Libya 95,918; Switzerland 38,550.
Lithium ore	--	8,900	Mainly to Israel.
Magnesite	r 443	342	Cuba 206.
Mica:			
Crude including splittings and waste	206	602	NA.
Worked including agglomerated splittings	70	61	NA.
Pigments, mineral including processed iron oxides	1,839	1,673	United States 590.
Precious and semiprecious stones except diamond:			
Natural value, thousands	$34	$60	NA.
Manufactured kilograms	275	427	NA.
Pyrite (gross weight)	6,901	54,696	Switzerland 43,122.
Salt, all forms	97,643	70,840	Portugal 28,655.
Sodium and potassium compounds:			
Caustic soda	361,479	352,166	Yugoslavia 61,181; U.S.S.R. 55,826.
Caustic potash	1,354	708	NA.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	282,590	296,707	West Germany 34,466; Spain 40,626.
Slate	3,422	3,064	NA.
Other	66,977	93,284	Switzerland 25,599; West Germany 17,183.
Worked, all forms	839,801	853,833	NA.
Dolomite, all grades	25,436	30,756	NA.
Gravel and crushed rock	r 598,714	642,550	West Germany 124,926; Libya 119,150.
Limestone (except dimension)	382	1,852	NA.
Quartz and quartzite:			
Piezoelectric crystal kilograms	--	5,540	NA.
Other	r 29,268	40,390	Switzerland 24,242; France 8,244.
Sand, excluding metal bearing	r 697,529	617,903	Switzerland 574,671.
Sulfur:			
Elemental, all forms	4,570	7,021	Yugoslavia 5,149.
Sulfur dioxide	39	59	NA.
Sulfuric acid	10,188	89,991	Greece 39,839; Yugoslavia 15,154.
Talc, steatite, soapstone	49,082	53,772	West Germany 15,552; United States 9,417.
Other:			
Slag, dross and similar waste, not metal bearing	223,167	249,236	Yugoslavia 187,706; France 28,901.
Oxides, hydroxides, and peroxides of magnesium, strontium, barium	r 1,501	5,370	United States 3,133.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals n.e.s	82,103	78,749	France 35,166; West Germany 12,796.

See footnotes at end of table.

Table 2.—Italy: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,033	968	NA.
Carbon black and gas carbon	48,143	33,986	Turkey 11,407; Austria 7,960; Iran 5,080.
Coal, all grades, including briquets	3,077	10,338	Switzerland 6,673.
Coke and semicoke	612,997	712,991	Romania 140,211; Spain 12,999; Algeria 66,506.
Peat	r 61	269	NA.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	50,142	49,019	United Kingdom 9,817; Netherlands 7,494.
Kerosine do	25,304	21,413	United Kingdom 1,993; Greece 1,808; Netherlands 1,711.
Distillate fuel oil do	72,989	62,887	Netherlands 7,121; France 6,898.
Residual fuel oil do	93,606	63,369	United States 6,886.
Lubricants do	1,677	1,837	Switzerland 242.
Other:			
Liquefied petroleum gas do	4,424	3,836	Egypt 874; Spain 699; Turkey 413.
Mineral jelly, and wax do	12	6	NA.
Bitumen and other residues do	r 1,861	990	Austria 572; Yugoslavia 131.
Bituminous mixtures, n.e.s do	177	85	Yugoslavia 12.
Petroleum coke and pitch coke do	290	280	Switzerland 130; France 75; Greece 41.
Total do	r 249,982	203,722	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	33,173	71,090	Spain 14,294; Yugoslavia 12,433; West Germany 8,400.

r Revised. NA Not available.
[1] Less than ½ unit.
[2] Revised to none.

Table 3.—Italy: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite	815,876	5,256	NA.
Ash and residue containing aluminum	r 41,831	42,915	Austria 24,666; France 5,871.
Oxide and hydroxide	r 188,883	67,465	France 28,431; Australia 17,674; West Germany 9,547.
Metals including alloys:			
Scrap	63,256	65,586	West Germany 16,260; France 10,888; Austria 9,555; Hungary 7,462.
Unwrought	185,558	256,065	Greece 49,343; France 48,800; West Germany 47,053; Netherlands 37,799.
Semimanufactures	46,746	70,251	West Germany 27,864; France 15,076; Belgium-Luxembourg 8,331.
Antimony:			
Ore and concentrate	r 2,687	2,326	Bolivia 905; Canada 874; Republic of South Africa 306.
Metal including alloys, all forms	172	112	Belgium-Luxembourg 42.
Arsenic trioxide, pentoxide, acids	1,082	1,852	France 964.
Beryllium metal including alloys, all forms kilograms	r 8,359	5,600	West Germany 5,100.
Bismuth metal including alloys, all forms	185	156	France 114; United Kingdom 23.
Cadmium	96	129	West Germany 32; Netherlands 18.
Chromium:			
Chromite	r 199,624	149,854	U.S.S.R. 43,820; Albania 40,945; Republic of South Africa 24,811.
Oxide and hydroxide	1,528	2,064	West Germany 1,450; U.S.S.R. 399.
Metal including alloys, all forms	r 295	208	France 52.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Cobalt:			
Oxide and hydroxide	301	398	Belgium-Luxembourg 331.
Metal including alloys, all forms	401	512	Belgium-Luxembourg 248; United States 132; France 68.
Columbium and tantalum:			
Ore and concentrate	171	544	Canada 520.
Metal all forms, including waste and scrap	r 205	36	United States 8.
Copper:			
Matte	--	183	United Kingdom 70; Yugoslavia 38.
Ash and residue containing copper	1,338	3,711	NA.
Copper sulfate	6,555	4,851	Yugoslavia 1,758; France 1,041; U.S.S.R. 950.
Metal including alloys:			
Scrap	57,013	66,388	West Germany 18,083; United States 15,814; France 15,388.
Unwrought	295,826	340,445	Zambia 75,736; Zaire 75,513; Chile 61,409.
Semimanufactures	27,756	34,311	West Germany 16,044; France 10,689.
Gallium, indium, thallium kilograms	r 967	800	NA.
Germanium do	r 4,178	40,200	Mainly from Belgium-Luxembourg.
Iron and steel:			
Ore and concentrate thousand tons	14,194	18,133	Liberia 3,812; Brazil 3,260; Australia 2,269; Venezuela 1,836.
Roasted pyrites do	2	78	Australia 35.
Metal:			
Scrap do	5,605	6,277	France 2,757; West Germany 2,080.
Pig iron, including cast iron and spiegeleisen do	1,017	1,039	West Germany 400; France 176; Yugoslavia 110; U.S.S.R. 108.
Sponge iron, powder, shot do	17	26	France 10; Sweden 10.
Ferroalloys:			
Ferromanganese do	121	154	France 74; Republic of South Africa 44.
Other do	122	165	France 37; Norway 28; Republic of South Africa 22; Yugoslavia 18.
Steel, primary forms do	2,157	1,783	France 466; West Germany 318; Belgium-Luxembourg 194.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	723	900	West Germany 294; France 252; Belgium-Luxembourg 124.
Universals, plates, sheets do	1,576	1,557	France 438; West Germany 346.
Hoop and strip do	228	231	France 80; West Germany 61; Belgium-Luxembourg 37.
Rails and accessories do	133	122	West Germany 48; France 34; Belgium-Luxembourg 15.
Wire do	61	84	Belgium-Luxembourg 31; France 18; West Germany 13.
Tubes, pipes, fittings do	274	274	West Germany 91; France 89; Yugoslavia 28.
Castings and forgings do	27	10	Yugoslavia 2; France 2; West Germany 2.
Total do	3,022	3,178	
Lead:			
Ore and concentrate	38,478	61,144	Canada 21,207; Poland 13,616; Greece 6,804.
Ash and residue containing lead	r 3,440	1,802	Canada 1,238.
Oxide	19,646	15,458	Mexico 11,152; France 1,588.
Metal including alloys:			
Scrap	20,263	29,229	France 9,063; United States 4,874; Switzerland 4,758; United Kingdom 4,614; West Germany 3,469.
Unwrought	141,125	164,655	West Germany 44,338.
Semimanufactures	1,562	833	Yugoslavia 519.
Lithium	r 16	8	U.S.S.R. 4.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Magnesium metal including alloys:			
Scrap	1,820	1,501	West Germany 1,145.
Unwrought	r 1,325	1,153	NA.
Semimanufactures	r 132	132	NA.
Manganese:			
Ore and concentrate	282,057	308,072	Gabon 153,187; Republic of South Africa 118,361.
Oxides	2,191	2,720	Japan 812; Belgium-Luxembourg 573.
Metal, all forms	r 2,564	2,770	France 1,346; Republic of South Africa 1,346.
Mercury 76-pound flasks	r 5,280	4,314	Yugoslavia 1,949; U.S.S.R. 600; Mexico 493.
Molybdenum:			
Ore and concentrate	r 6,699	8,439	Netherlands 5,013; United States 1,011.
Metal including alloys, all forms	r 70	79	Austria 36; Netherlands 8.
Nickel:			
Matte, speiss and similar materials	5,152	4,622	Canada 3,818.
Metals including alloys:			
Scrap	1,383	1,609	Canada 442; France 194.
Unwrought	14,276	15,441	Cuba 2,787; Norway 2,339; Republic of South Africa 1,762.
Semimanufactures	2,579	3,796	West Germany 1,309; United Kingdom 933; United States 590.
Platinum-group metals and silver including alloys:			
Platinum group thousand troy ounces	1,034	188	United Kingdom 104.
Silver do	r 54,080	43,976	United States 13,597; West Germany 8,427; United Kingdom 8,350.
Rare-earth metals:			
Oxides and other compounds value, thousands	$549	$502	France $444.
Metals:			
Cerium	93	288	NA.
Other	351	414	West Germany 268; Austria 110.
Selenium, elemental	57	35	West Germany 15; United States 7; Japan 4.
Silicon, elemental	1,504	8,951	France 1,809.
Tellurium and arsenic	54	68	Sweden 30; Canada 21.
Thorium value	$200,873	$45	NA.
Tin:			
Oxide	63	54	NA.
Metal including alloys:			
Scrap	5	39	NA.
Unwrought	9,762	11,241	Malaysia 6,042; Thailand 2,392; Indonesia 1,330.
Semimanufactures	183	311	West Germany 166; Belgium-Luxembourg 52.
Titanium:			
Ore and concentrate	r 134,224	277,033	Norway 141,278; Australia 19,948.
Oxides	r 40,053	41,233	West Germany 17,784; France 8,782; Netherlands 6,145.
Metal including alloys, all forms	1,737	1,973	Austria 707; United States 458; U.S.S.R. 411.
Tungsten:			
Ore and concentrate	175	277	Australia 104.
Metal including alloys, all forms	r 68	90	NA.
Uranium metal	14	8	Mainly from United States.
Vanadium oxide and hydroxide	923	588	West Germany 475.
Zinc:			
Ore and concentrate	227,005	300,794	Canada 79,758.
Ash and residue containing zinc	4,915	2,715	Switzerland 1,617.
Oxide and hydroxide	5,025	4,321	France 1,302; West Germany 1,103; Netherlands 578.
Metal including alloys:			
Scrap	4,641	45,021	West Germany 11,906; Belgium-Luxembourg 9,229.
Blue powder	1,632	1,613	Belgium-Luxembourg 907; West Germany 318.
Unwrought	r 61,412	22,532	United States 6,197.
Semimanufactures	r 5,956	4,930	Belgium-Luxembourg 2,831.
Zirconium:			
Ore and concentrate	36,127	32,858	Australia 27,531.
Metal including alloys, all forms kilograms	r 67,454	108,700	NA.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Other:			
Ore and concentrate	r 18,126	9,230	Canada 5,210; Turkey 2,300.
Ash and residue containing nonferrous metals, n.e.s	r 23,090	5,877	United States 792; France 617.
Oxides and hydroxides	r 2,164	4,498	Cuba 2,475; West Germany 592.
Metals including alloys, all forms:			
Metalloids	117	82	NA.
Alkali, alkaline earth, rare-earth metals, n.e.s	6,783	6,075	West Germany 4,562.
Pyrophoric alloys	9	17	NA.
Base metals including alloys, all forms, n.e.s	45	6	NA.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, etc	r 1,769	3,210	NA.
Dust and powder of precious and semiprecious stones value, thousands	$7,054	$6,324	Zaire $1,944; United States $1,833; Netherlands $771.
Grinding and polishing wheels and stones	r 3,813	11,499	France 1,806; West Germany 1,459.
Asbestos	60,183	66,164	Republic of South Africa 28,857; Canada 23,363.
Barite and witherite	36,041	24,840	Spain 6,200; Tunisia 5,530; France 5,218.
Boron materials:			
Crude and natural borates	r 106,783	167,401	Turkey 141,312.
Oxide and acid	r 1,048	272	NA.
Cement	59,336	690,854	Libya 244,007; Israel 186,206; Yugoslavia 115,593.
Chalk	7,607	11,808	France 10,799.
Clays and clay products:			
Crude clays, n.e.s.:			
Bentonite	r 25,892	26,842	Greece 18,319; West Germany 4,290.
Kaolin	r 635,484	736,478	United Kingdom 352,111; United States 159,321; France 87,598.
Other	r 655,457	861,536	West Germany 279,474; France 273,539; United States 123,008.
Products:			
Refractory	141,542	86,308	Argentina 16,066; West Germany 10,904; France 8,713.
Nonrefractory	33,681	1,148,000	France 293,255; West Germany 212,466; Switzerland 133,712.
Cryolite and chiolite	471	403	Denmark 358.
Diamond:			
Gem, not set or strung value, thousands	$16,088	$23,683	Belgium-Luxembourg $9,812; Thailand $2,564; Israel $2,401.
Industrial do	r $3,287	$4,467	Belgium-Luxembourg $3,358.
Diatomite and other infusorial earth	5,545	6,606	West Germany 1,480.
Feldspar	r 22,073	21,099	Norway 5,775; West Germany 3,957; Portugal 3,779.
Fertilizer materials:			
Crude thousand tons	1,847	2,155	Morocco 1,372; United States 523.
Manufactured:			
Nitrogenous	69,894	85,580	West Germany 38,463; France 13,904.
Phosphatic	178,103	152,280	France 46,549; Tunisia 34,203; Belgium-Luxembourg 32,315.
Potassic	315,174	363,788	Israel 99,492; France 96,977; U.S.S.R. 88,870.
Other	186,736	94,305	West Germany 30,315; United States 18,135; Algeria 16,470.
Ammonia	7,170	42,087	Netherlands 33,372.
Fluorspar	37,457	67,465	Mexico 23,417; France 20,266; Tunisia 17,352.
Graphite, natural	4,796	5,475	West Germany 3,261.
Gypsum and plasters	2,761	3,710	United States 1,706.
Lime	r 103	20	NA.
Lithium ore	1,073	378	NA.
Magnesite	r 57,080	76,693	Greece 32,664; Yugoslavia 15,453; Ireland 14,676.
Mica:			
Crude, including splittings and waste	1,148	1,458	India 317.
Worked, including agglomerated splittings	279	415	France 105; Belgium-Luxembourg 80.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Pigments, mineral, iron oxides	r 23,926	29,078	West Germany 17,429; France 3,823.
Precious and semiprecious stones, except diamond:			
Natural value, thousands	$673	$569	NA.
Manufactured kilograms	r 21,019	20,588	Mainly from Switzerland.
Pyrite, gross weight thousand tons	301	293	U.S.S.R. 228; Cyprus 51.
Salt	200,041	49,589	France 13,856.
Sodium and potassium compounds	r 34,766	98,615	France 51,263; West Germany 26,040.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous, including marble	r 161,748	172,119	Portugal 41,583; Yugoslavia 38,332.
Slate	2,904	2,003	NA.
Other	r 154,766	196,430	Republic of South Africa 52,329; Norway 26,708.
Worked, all forms	3,991	2,741	West Germany 1,082; Belgium-Luxembourg 475; France 455.
Dolomite	r 2,045	2,214	NA.
Gravel and crushed rock	r 10,664	12,692	France 6,141.
Limestone (except dimension)	484	1,103	Republic of South Africa 377.
Quartz and quartzite:			
Piezoelectric crystal kilograms	r 30	35	Belgium-Luxembourg 18; Netherlands 12.
Other	r 114,433	94,550	Switzerland 38,018; Portugal 19,753.
Sand, excluding metal bearing thousand tons	1,052	1,301	Belgium-Luxembourg 584; France 542.
Sulfur:			
Elemental, all forms	r 419,082	766,257	Canada 368,982; Poland 103,785.
Sulfur dioxide	123	--	
Sulfuric acid	76,568	52,956	United Kingdom 16,486; Poland 7,133; Spain 5,679.
Talc, steatite, soapstone, pyrophyllite	r 20,277	25,357	Austria 14,307; France 5,949.
Other:			
Slag, dross, and similar waste, not metal bearing	r 26,238	42,047	Austria 9,480; Yugoslavia 8,015; France 7,291; Bulgaria 6,683.
Oxides and hydroxides of strontium, barium and magnesium	4,531	2,989	West Germany 1,278; United States 667; France 452.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	24,482	26,267	Austria 6,248; France 5,017.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen	1,821	1,424	United States 1,032.
Carbon black and gas carbon	r 31,967	22,263	France 7,831; Netherlands 4,979; West Germany 3,906.
Coal and briquets:			
Anthracite and bituminous thousand tons	10,749	12,208	United States 3,461; West Germany 3,214; Poland 2,677; U.S.S.R. 1,548.
Briquets of bituminous coal and anthracite do	11	38	Poland 24; U.S.S.R. 5; West Germany 4; France 4.
Lignite and lignite briquets do	111	148	West Germany 76; Yugoslavia 59.
Coke and semicoke do	111	124	France 68; Poland 36; Hungary 13.
Gas, natural, liquefied million cubic feet	76,691	72,830	All from Libya.
Peat thousand tons	r 30	32	West Germany 13; U.S.S.R. 8; Poland 5.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	784,764	884,902	Saudi Arabia 295,047; Libya 185,914; Iran 106,845; Iraq 99,940.
Refinery products:			
Gasoline do	7,963	6,737	U.S.S.R. 3,379.
Kerosine do	999	776	U.S.S.R. 336; Trinidad and Tobago 286.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Distillate fuel oil thousand 42-gallon barrels	3,601	6,387	U.S.S.R. 4,310.
Residual fuel oil do	17,676	24,589	U.S.S.R. 7,725; Romania 3,516; Netherlands Antilles 2,814.
Lubricants do	1,289	1,296	United States 412; United Kingdom 262; West Germany 191.
Other:			
Liquefied petroleum gas do	476	14,890	Netherlands 9,522; U.S.S.R. 4,548.
Mineral jelly and wax do	445	481	West Germany 127; People's Republic of China 84; U.S.S.R. 82.
Bitumen and other residues do	r 1,811	1,870	United States 983; Albania 656.
Bituminous mixtures, n.e.s do	35	38	France 18; United States 6.
Petroleum coke and pitch do	3,481	3,484	United States 2,012.
Total do	r 37,776	60,548	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	60,107	122,441	United States 37,153; Spain 23,400.

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—Domestic output of aluminum was dependent on imported bauxite. Metal production was below demand and imports of aluminum were essential for the Italian manufacturing industry. Most of the aluminum output came from plants of Alumetal S.p.A. at Bolzano, Mori, and Venice-Fusina. Other producers of primary aluminum were Società Aluminio Veneto per Azioni S.p.A. (SAVA) at Fusina, Porto Marghera, and Alcan Aluminio Italiano, a Canadian subsidiary, at Borgo Franco. About two-thirds of total aluminum supply was used by the automobile manufacturing, construction, and appliance industries.

Antimony.—During 1975 no major events were reported in the antimony-producing industry of Italy. Antimony ore was mined at the Tafone mine near Grosseto. Domestic and imported stibnite ores were processed to regulus at the Azienda Minerali Metallici Italiane S.p.A. (AMMI) operated smelter near Manciano.

Copper.—Construction continued on a 100,000-ton-per-year copper rod manufacturing plant near Avellino. The plant is 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 agency, will manage the new facility.

During 1975 there was a small mine production of copper in Italy. The copper-processing industry of Italy was largely dependent on imports of copper to meet the demand.

Iron and Steel.—During 1975 Italy remained dependent on imports of iron ore, scrap, and some pig iron to meet the demand of its steel industry, which was among the largest in Europe. However, production of all sectors was lower than in 1974. Domestic iron ore, averaging about 44% iron, was produced in mines on Elba Island, operated by Italsider S.p.A. In comparison with consumption, domestic output was not significant (3.3% of annual consumption).

Steel producers operated at about 80% of installed capacity during 1975. Italsider, headquartered in Genoa and with plants in Taranto, Bagnoli, Cornigliano, Campi-Corso, Novi Ligure, Trieste, Maghera, San Giovani Valdarno, Lovere, and Savona, remained the principal producer of iron and steel in Italy. Dalmine of Milan and Fiat S.p.A. of Turin were other leading producers. Salient statistics for iron and steel are shown in table 4.

Table 4.—Salient statistics on iron and steel production
(Thousand metric tons)

Year	Pig Iron			Ferro-alloys	Crude Steel					Hot-rolled steel [2]	Iron rolled from rerolling scrap	Other finished products [3]
	Blast furnace	Electric furnace	Total [1]		Open hearth furnace	Electric furnace	Converter	Other	Total [1]			
1955	1,371	253	1,625	106	3,052	2,141	355	--	5,548	4,000	26	180
1956	1,643	230	1,873	120	3,372	2,370	334	--	6,076	4,416	21	185
1957	1,842	230	2,072	135	3,896	2,704	380	--	6,979	5,014	107	201
1958	1,838	222	2,060	107	3,612	2,501	336	--	6,449	4,635	119	172
1959	1,886	212	2,098	94	3,751	2,803	399	--	6,954	5,084	119	164
1960	2,373	310	2,683	141	4,601	3,412	449	--	8,462	6,484	147	209
1961	2,771	285	3,056	145	4,986	3,765	632	--	9,383	7,043	155	242
1962	3,307	249	3,556	122	5,160	3,960	637	1	9,757	7,386	161	242
1963	3,508	232	3,741	127	5,266	4,235	655	1	10,157	7,835	145	227
1964	3,249	249	3,498	127	4,886	4,226	680	1	9,793	7,617	124	201
1965	5,252	237	5,490	141	5,146	4,745	2,789	2	12,681	9,780	89	208
1966	6,082	177	6,259	158	4,955	4,970	3,711	3	13,639	10,329	74	230
1967	7,052	242	7,294	170	5,618	5,997	4,272	3	15,890	12,156	78	299
1968	7,619	207	7,826	168	5,665	6,427	4,869	3	16,964	13,248	75	320
1969	7,542	238	7,781	167	5,204	6,554	4,666	4	16,428	13,353	66	333
1970	8,109	222	8,332	197	4,841	6,994	5,438	5	17,277	13,929	68	361
1971	8,411	125	8,536	191	3,999	7,073	6,375	5	17,452	13,969	65	328
1972	9,347	68	9,415	219	3,988	8,075	7,745	6	19,815	15,342	66	281
1973	9,976	57	10,033	238	3,628	8,633	8,728	7	20,995	17,288	74	293
1974	11,623	62	11,686	249	3,511	9,860	10,424	8	23,803	19,153	75	291
1975	11,293	58	11,350	240	2,456	9,381	9,991	8	21,836	NA	NA	NA

NA Not available.
[1] Data may not add to totals shown because of independent rounding.
[2] Rolled steel structurals: plates, sheets, tinplates, wire rods, rails, etc.
[3] Including forged steel castings and other finished products, excluding welded tubes.

Source: Associaziono Nazionale Industrie Siderurgiche (ASSIDER).

Lead and Zinc.—Complex sulfide ores mined in Sardinia and the northeastern part of Italy remained the principal source of mine production of lead and zinc in the country. Output of lead concentrates decreased. Production of concentrate assaying 52% zinc metal increased somewhat over output in 1974. Declining output of lead metal, however, was apparently due to increased labor costs, decreasing grade of ore mined, and removal of the protective tariff. At the Salafossa mine, operated by Pertusola in the Province of Belluno, an increase in production of zinc resulted from introduction of sublevel caving (mining method). In addition, a new pumping station, completed during 1975 in the Inglesiente Basin in Sardinia, lowered the water table and eliminated water-caused delays in production.

Manganese.—During 1975 manganese production ceased when reserves at Italy's only producer, the Gambrosa mine near Genoa, were exhausted.

Mercury.—Italy ranked second to Spain among producers of mercury in West Europe. Low world price and low demand did not affect production rates at Italy's mercury mines. End of mine production would create political and social problems in mining areas. Consequently, stocks of mercury increased.

A decline in ore reserves and increasingly higher labor costs have made Italian mercury production less competitive on world markets. The 1975 employment at five operations totaled 1,013 workers. The Bagnore and Mt. Labbro mines were closed in early 1975 and were expected to remain on maintenance and/or development status during most of the year. Increase of output resulted from modernization of mines under the corporate management of Società Mercurifiera Monte Amiata, a subsidiary of Ente Autonomo di Gestione Per le Aziende Minerarie Metallurgiche (EGAM). New mechanization and new mining methods were introduced during 1975. At the Marone mine exploration disclosed important new reserves of cinnabar ores. Quantities of new reserves were not made public at yearend.

The United Kingdom and East Germany remained the leading importers of Italian mercury. Mercury stocks were equal to about 4 years of production at the 1975 rate.

Titanium.—Discovery of a rutile deposit located at Pianpadulo, in the Province of Savona, was announced. The Società Mineraria Italiana and Talco-Grafite Val Chisone S.p.A. started work on a 1-million-ton-per-year open pit mine and construction of a titanium extraction plant. The new plant will produce 20,000 tons per year of 95% TiO_2 ilmenite concentrates. Operations of the plant are based on a process developed and patented by Talco-Grafite. Proven reserves reportedly amount to 31 million tons of ore with an average content of 6% TiO_2, and probable reserves amount to 21 million tons.

Uranium.—Plans for introduction of nuclear energy on a large scale included development of domestic uranium deposits. Azienda Generale Italiani Petroli S.p.A. (AGIP) started work on 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, containing an estimated 10,000 tons of uranium oxide, was reportedly discovered by AGIP in the Lazio region. Development of the deposit was scheduled for the early 1980's.

NONMETALS

Asbestos.—Most of Italy's chrysotile asbestos came from the San Vittore open pit mine and mill operated by Società Amiantifera di Balangero S.p.A. near Turin. During 1975 about 130,000 tons of fiber was produced at San Vittore. In addition, small tonnages of tremolite were produced from two operations at Sondrio and Aosta in the Lake Como area. The product consisted of long-fiber materials.

Cement.—Italy's cement industry ranked second to the U.S.S.R. among European countries. The industry comprised 120 plants with an annual capacity of 72 million tons, one-half of which were in northern Italy. Reduced demand for cement in construction was reflected in lower production when compared with the output before the economic slowdown.

Clays.—*Bentonite.*—During 1975 Società Mineraria Isole Pontine S.p.A. (SA-

MIP) continued exploration and development of a large bentonite deposit estimated at 10 million tons near Isili, Sardinia. Sardinia was the chief source of bentonite in Italy.

Feldspar.—The economic slowdown did not affect demand for feldspar in Italy, mostly because of increased use in the ceramic industry and stable export markets. The Giustino mine operated by Società Maffai Feldspato S.p.A. remained the largest producer of feldspar during 1975. The Società Esercizo Cave Feldspato S.p.A. mined feldspar from the Tremenico pegmatite deposit south of Legnone.

Fertilizer Materials.—*Phosphates.*—Construction continued on a plant to produce phosphoric acid and a range of phosphate compounds at Monfalcone, near Trieste. The facility, built by Fosfitalia S.p.A., will have a designed capacity of 250,000 tons of phosphoric acid annually.

Italy depends entirely on importation of phosphates for its requirements. In 1975 Morocco was the principal supplier.

Potash.—Output came from mines near Palo, Racalmuto, Pasquasia, and Corvillo, in central Sicily. Montedison operated a processing facility at Campofranco, Sicily. Virtually all potassium ore production (1.8 million tons) was processed into chemical fertilizers. In the Pasquasia mine in Sicily, production shifted to kainite layers because sylvinite and carnalite were exhausted.

Fluorspar.—Italy's fluorspar industry was dominated by two companies, Montedison and Società Mineraria Silius S.p.A. The fluorspar mines in Sardinia accounted for more than 55% of the nation's output. Mines in northern Italy Trentino-Alto Adige also were important producers.

During 1975 Fluormina S.p.A., owned 50% each by EGAM and Montedison, was organized and started operations. At yearend, production began in a 12,000-ton-per-year fluorspar pelletizing plant located near Brescia, operated by Fluormina. The plant used fluorspar flotation concentrates from Fluormina's domestic operations.

Pyrite.—The Boccheggiano mine in Tuscany Province operated by EGAM was closed because of exhaustion of ore reserves. In the Gavorrano mine, improved mining methods and introduction of heavy mining equipment resulted in higher output. EGAM started preliminary work on development of a deposit in the Campiano area, Tuscany Province, containing an estimated 30 million tons of pyrite at a depth ranging from 1,500 to 3,000 feet. The mine was planned to 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. Completion of development was expected by 1977 with production beginning in 1979.

Montedison's Scarlino plant continued processing pyrite concentrate to iron pellets and sulfur. Installation of new equipment and change in processing technology proved to be effective in lowering pollution.

Italy continued to rank second to Spain among Western European countries in the production of pyrite. Although output was close to 1 million tons, imports were necessary. The U.S.S.R. was the principal supplier of the imported pyrite.

Salt.—The 1975 output of salt totaled over 3 million tons. Sicilian plants produced about one-third of the nation's output. Decline in output reflected slowdown in the chemical industry.

Società Industria del Salgemma S.p.A. started 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 and Ornamental Stone.*—Production of marble and ornamental stone (about 2.5 million tons) remained an important segment of the mining industry of Italy. Slightly over 3,000 quarries, employing 49,000 persons, were in production at yearend. However, stone-plant utilization was low, about 68%, reflecting the general economic slowdown. Mining and processing of ornamental stone was carried on both in large producing basins (with many quarries) formed by considerable deposits of rocks with uniform chromatic, technological, and commercial qualities; and in isolated quarries. The most important of the large production basins follow: Marbles at Botticino (Lombardy), Aurisina and Repen (Eastern Venetia), Alpi Apuane (Tuscany), Trani and Apricena (Apulia), and Trapani (Perlato de Sicilia); granite at Lago Maggiore (Piedmont) and Sardinia; and travertine at Tivoli and Rapolano. A large number of individual locations produced ornamental stone throughout Italy, of which the most important were green marbles at Val d'Aosta and Val di Susa, rose- and gold-colored marbles near Lago Maggiore, black marbles at Lago Iseo, red marble at Asiagio, and travertine at Ascoli Piceno.

Sulfur.—During 1975 most of the sulfur production came from mines in Lazio, Calabria, and Campania. Sulfur ore also was mined at five small mines in Sicily. During the year six mines were closed and production from two other mines will be terminated in 1977.

MINERAL FUELS

Petroleum, mostly imported, remained the principal source of energy in Italy, supplying 80% of the total. Domestic output (approximately three-fourths natural gas, one-fifth hydroelectric power, and the rest petroleum, coal, and fuelwood) accounted for about 12% of the nation's energy supply. Crude oil, 90% of Italy's fuels imports, imposed a heavy burden on the economy and on the foreign trade balance of the country. Plans were pursued in 1975 to introduce nuclear power generation into the country on a large scale, in order to lower Italy's dependence on imported crude oil.

Coal.—Domestic production of coal and lignite was a minor part (0.3%) of the total energy supply of Italy. Production of the Seruci mine in Sardinia (Sulcis coal basin) dropped to 2,050 tons, about 45% below 1974 figures. Production of lignite, 2 million tons, was the same as during 1975 despite the closing of a mine in the Province of Potenza.

The coal deposits in the Sulcis Basin are low in thermal quality and high in sulfur and ash content. However, because of the sharp increase in crude oil costs, the Government was studying the feasibility of reopening closed mines. Reportedly, an investment of $130 million in modern mining equipment would be adequate to sustain a profitable annual production of 2 million tons of coal. Proven coal reserves in the basin were given as a total of 150 million tons.

Imports of high-rank coals and coke (about 12 million tons) were necessary to meet the demand of the country's coking plants and other metallurgical installations. The United States was the principal source of imports.

Nuclear Energy.—During 1975 the Italian Ministry of Industry and Commerce was preparing an energy plan for Italy. Highest priority and emphasis was placed on nuclear energy in this plan. According to the plan, a total new capacity of 25,500 megawatts electric should be brought into operation between 1975 and 1982. Most of the planned plants would be of 1,000-megawatt capacity. An additional 40 units, also 1,000 megawatts each, were planned to become operational between 1990 and 2000.

Table 5.—Italy: Supply and apparent consumption of energy-producing materials for 1973 and 1974
(Million tons of standard coal equivalent) [1]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Fuelwood	Hydro-electric power and nuclear
1973:						
Production	28.2	0.7	1.6	20.4	(2)	5.5
Imports	196.2	10.8	182.6	2.4	(2)	.4
Exports	40.4	.5	39.6	(2)	(2)	.3
Apparent consumption	184.0	11.0	144.6	22.8	(2)	5.6
1974:						
Production	28.0	.7	1.6	20.3	(2)	5.4
Imports	198.5	12.4	180.1	5.5	(2)	.5
Exports	32.5	.7	31.6	(2)	(2)	.2
Apparent consumption	194.0	12.4	150.1	25.8	(2)	5.7

[1] 1 ton of standard coal equivalent (SCE).=7,000,000 kilocalories.
[2] Less than ½ unit.

Source: United Nations (New York). World Energy Supplies, 1950–1974. Statistical Papers, Series J, No. 19, 1976, p. 326.

Petroleum and Natural Gas.—Domestic natural gas and petroleum contributed 14% and 77%, respectively, to the total energy supply of Italy. Imports of natural gas, mostly from the Netherlands, the U.S.S.R., and Libya, and crude oil, mostly from Saudi Arabia, Iran, and Iraq, were essential to meet the demand. Shipments of liquefied gas (about 230 million cubic feet per day) to Italy were resumed by Esso Libya. Deliveries had been suspended in the fall of 1974.

Natural gas was produced from fields in the Po Valley, from offshore Ravenna, at Ferrara, and in southern Italy. Offshore natural gas production was 50% of the total country output. Petroleum was produced in the oilfields of Gela and Ragusa.

At yearend 1975 there were 36 refineries in operation, with a total installed annual capacity of 200 million tons. Italy ranked first among EEC nations in crude oil refinery capacity. The refinery capacity was double the country's domestic consumption.

Ente Nazionale Idrocarburi (ENI), a state-owned concern, remained the principal Italian entity in the petroleum and natural gas industry. ENI was active, through its subsidiaries, in all aspects of the industry. In the fall of 1975, ENI unveiled a 5-year investment program providing for allocations totaling an equivalent of about $10 billion. The fund will be used for exploration for oil and gas in Italy and abroad and for developing alternate energy sources. About two-thirds of the total will be spent in Italy.

During 1975 exploration for liquid and gaseous hydrocarbon was conducted onshore and offshore in Italy.

ENI's natural gas exploration division announced that the exploratory well at Turbigo in the Province of Novara, about 30 kilometers west of Milan, showed traces of natural gas. Depth of the new discovery was at 6,200 meters. The new discovery was in Triassic rock that is older than the Melossa rock (also Mesozoic) where previous discoveries were made. Consequently, what seems to have been discovered could be a new structure underlying the Melossa.

Another ENI exploratory well, about 2 kilometers east of Cape Colonna near Crotone, discovered gas at a depth of 1,700 meters. This was the second discovery in the same general area. As a result of the latest find, ENI may increase its offshore drilling in the Ionian Sea.

The evaluation of a gas discovery near Rimini continued during 1975. Results confirmed capacity of 500,000 cubic meters per day.

Except for difficulties in selling high-sulfur crude oil from the Gela Field and the continuing slow downtrend of crude oil output, production of crude oil was uneventful. Construction continued on two refineries, one at Melilli and one at Porto Gruaro. The Melilli facility is jointly owned by ENI and a group of private investors. The Porto Gruaro facility is jointly owned by Azienda Nacionale Indrogenazione Combustibili (ANIC) and ENI.

About 300 kilometers of pipeline was completed in Italy during 1975, bringing the total length of the pipeline network to about 12,000 kilometers.

The Mineral Industry of Japan

By E. Chin [1]

Stemming primarily from the world oil crisis of 1973, Japan suffered from inflation, recession, and a worsening of the deficit in balance of payments in 1974. During 1975, the economy not only experienced a second year of recession, but also faced high unemployment and fiscal crisis at national and local levels. Unemployment increased to around 1 million or about 2% of the work force and was continuing upward, an unusual situation for Japan in which lifetime employment is an established practice. Inflation curtailed per capita spending resulting in a sharp fall in personal consumption. Corporate profits diminished and it was estimated that one out of three companies were operating at a loss.

In an attempt to restore an equilibrium in the balance of payments and to arrest inflation, there was a slowdown in economic growth. From an annual average growth rate of 10% during 1960–72, the real growth rate in Japan fell to 6.1% in 1973, minus 0.2% in 1974, and to 2.6% in 1975. Tightening of the economic reins by the Government in monetary and fiscal policy was allegedly responsible for the steep decline in growth in 1974. In an attempt to push up the growth rate, the Government's austerity program was relaxed in 1975. However, personal consumption had markedly declined, and with depressed exports and business capital investments, coupled with inventory buildups, the recession gained momentum.

The Japanese metals and minerals industry experienced a serious business slump in 1975 in the midst of a prolonged recession. To improve the deteriorating conditions caused by decreased demand, the industry curtailed production to reduce inventory, and attempted to renegotiate delivery of minerals and ores under long-term contracts, stabilize wages, and raise prices of finished products.

Production cutbacks were carried out in major industries and as a consequence about one-quarter of the manufacturing capacity was held idle. The automobile and home electric appliance industries were the two major areas enjoying brisk sales, while the steel and petrochemical had poor sales records. Production of steel was kept at about 30% below the normal output throughout 1975 to cope with a slackening of domestic demand and with decreases in exports. The profitability of the steel and petrochemical industries was also undermined because markup of prices of their products was restrained under the guidance of the Ministry of International Trade and Industry (MITI). While price adjustments occurred in steel and petrochemical products, the increases were smaller than necessary to absorb the cost increases arising from the higher price of crude oil. Additionally, the industries were enduring the pressure of inventories which were not diminishing appreciably despite the cutback in production.

The foreign exchange yen (Y) quotation was stable from February through October 1973, ranging from 264 to 266 against the U.S. dollar ($1.00). However, the rise of crude oil prices drove the yen to a rate of 301 by yearend 1974. The yen was strongest in February 1975 where it was quoted around 287. However, the foreign exchange quotations of the yen started to sag around midyear and at the end of 1975 it was Y305 to $1.00. Factors contributing to the new exchange rate were the drop in exports and a dwindling of foreign investments in Japanese securities.

Japan's overseas investments in fiscal

[1] Physical scientist, International Data and Analysis.

year 1974 (April 1974–March 1975) declined 31% to Y2,396 million from Y3,497 million in the preceding year. Although investments declined in almost all sectors those in the mineral industry rose to Y743 million. Investments for oil development in Indonesia and Peru accounted for 63% of overseas mineral industry investment, indicating a strong intention for securing energy resources.

MITI completed preparation of bills to be submitted to the Diet for reorganizing the Japan Copper Development Fund into the Japan Nonferrous Metals Stockpiling Association for stockpiling aluminum, copper, lead, and zinc and another group for rare metals including nickel, chromium, cobalt, and tungsten. The nonferrous stockpiling agency was to be formed in fiscal year 1976 with government financial aids raching Y30,000 million. Eighty percent of the financing was reportedly earmarked for copper, 10% for aluminum, and 5% each for lead and zinc. The Government would provide Y369 million in interest subsidy to enable the corporation to borrow at 6.5% interest. The rare metals stockpiling corporation would receive a small subsidy of Y52 million from the Government. Other funds will be provided by 20 participating investing firms.

Consideration of stockpiling schemes began during 1973 as an insurance against short supplies resulting from strikes, political upheavals, or possible cartel-like actions in supplying countries. By financing the stockpile program of the minerals imported under long-term contracts, the Government hoped to stabilize sources, to maintain cordial relations with supplying countries, and to moderate the extremes of price swings.

PRODUCTION

Japan's industry endured the longest and deepest recession since 1945 according to Nihon Keigai Shimbun, a respected economics publication. The recession, lasting for more than 2 years since 1973, was severe in that the level of mining and manufacturing production plunged more steeply than during any recession in the past. Industrial output in 1975 was 5% below the 1974 level. The utilization rate of production capacity in the manufacturing industry was estimated to have remained around 75% throughout 1975.

Due to the sluggish demand in domestic and foreign markets, production of minerals and metals were generally reduced across the board to avoid an excessive buildup of inventory. Crude steel production totaled 102.3 million tons, down 12.6% from 1974. Aluminum metal production was 9.6% lower than the prior year's output. However, Japan continued to be a major world producer of aluminum, coke, copper, lead, steel, and zinc despite the reduced economic activity. Japan is much more important as a metal producer and consumer than as an ore producer. In mine output, Japan is only of some significance in construction raw materials, coal, zinc, and copper.

Table 1.—Japan: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Aluminum:			
Alumina, gross weight	1,987	1,801	1,565
Metal:			
Primary:			
Regular grades	1,097	1,118	1,013
High purity	6	6	3
Total	1,103	1,124	1,106
Secondary	536	517	424
Antimony:			
Oxide tons	4,492	4,405	2,851
Metal do	2,783	2,166	2,523
Arsenic, white (equivalent of arsenic acid) do	292	193	e 200
Bismuth do	855	794	671
Cadmium do	3,160	3,077	2,657
Chromium:			
Chromite, gross weight do	23,174	25,858	23,149
Metal do	2,001	2,146	2,739

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
METALS—Continued			
Cobalt metal ______ tons	--	10	48
Columbium and tantalum, tantalum metal ______ do	43	52	12
Copper:			
Mine output, metal content	91	82	84
Metal:			
Blister	1,001	953	821
Refined	951	996	818
Germanium:			
Oxide ______ tons	[r] 16	16	12
Metal ______ do	[r] 27	17	13
Gold:			
Mine output, metal content ______ thousand troy ounces	188	140	176
Metal ______ do	1,053	1,123	1,110
Indium metal [e] ______ do	550	550	550
Iron and steel:			
Iron ore and iron sand concentrates	1,007	778	779
Roasted pyrite concentrate (50% or more Fe)	[r] 889	893	675
Pig iron and blast furnace ferroalloys	90,007	90,437	86,877
Electric furnace ferroalloys:			
Ferrochrome	443	542	486
Ferromanganese	617	624	650
Ferronickel	200	251	201
Ferrosilicon	354	369	327
Silicomanganese	376	448	435
Other [1]	25	21	31
Steel:			
Crude	119,322	117,131	102,314
Semimanufactures, hot rolled:			
Ordinary steel	92,574	91,039	77,879
Special steels	9,161	9,289	7,955
Lead:			
Mine output, metal content	53	44	51
Metal, refined:			
Primary	189	228	194
Secondary	39	49	48
Magnesium metal:			
Primary ______ tons	11,203	8,928	8,538
Secondary ______ do	8,107	10,877	9,227
Manganese:			
Ore and concentrate, gross weight	189	167	158
Oxide	38	45	42
Metal ______ tons	10,080	8,659	8,265
Mercury:			
Mine output, metal content ______ 76-pound flasks	3,742	551	--
Metal ______ do	3,742	1,595	NA
Molybdenum:			
Concentrate output, metal content ______ tons	157	106	234
Metal ______ do	458	341	206
Nickel metal, primary ______ do	21,726	20,992	13,019
Platinum-group metals:			
Palladium metal ______ troy ounces	10,014	13,419	14,334
Platinum metal ______ do	6,827	5,451	5,867
Rare-earth metals:			
Lanthanum oxide ______ tons	161	130	21
Cerium metal ______ do	NA	289	NA
Selenium, elemental ______ do	[r] 358	334	417
Silicon metal ______ do	247	249	231
Silver:			
Mine output, metal content ______ thousand troy ounces	8,552	7,314	10,063
Metal, primary ______ do	31,612	32,121	8,649
Tellurium, elemental ______ tons	24	26	21
Tin:			
Mine output, metal content ______ do	811	548	655
Metal:			
Primary ______ do	1,350	1,328	1,212
Secondary ______ do	122	102	46
Titanium:			
Concentrate, gross weight ______ do	1,506	1,398	NA
Slag ______ do	4,255	4,404	4,483
Metal ______ do	6,507	8,913	7,582
Tungsten:			
Mine output, metal content ______ do	940	810	969
Metal ______ do	2,018	1,655	885
Uranium metal ______ kilograms	2,000	10,535	NA

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS—Continued			
Zinc:			
Mine output, metal content	264	254	285
Oxide	64	56	52
Metal:			
Primary	844	850	702
Secondary	r 21	22	63
Zirconium metal	149,154	15,810	NA
NONMETALS			
Asbestos	9	5	5
Barite	r 64	38	38
Bromine, elemental e	11	11	11
Cement, hydraulic	78,024	72,684	61,392
Clays:			
Fire clay	1,353	1,411	1,178
Kaolin	r 399	413	206
Feldspar [2]	r 545	552	363
Fertilizer materials:			
Crude potassic (potassium carbonate), gross weight	29	27	24
Manufactured:			
Nitrogenous (N content) [3]	r 2,199	2,138	2,341
Superphosphates	700	798	520
Fluorspar, all grades e	8	8	8
Graphite (crystalline) e	800	800	800
Gypsum	r 368	334	197
Iodine, elemental ____ tons	7,292	6,647	6,813
Lime (quicklime)	11,815	11,215	9,172
Pyrite and pyrrhotite (including cupreous):			
Gross weight	1,275	1,286	1,096
Sulfur content	569	626	539
Salt, all types	1,015	1,115	1,012
Stone, sand and gravel, n.e.s., crushed and broken stone:			
Dolomite	r 3,083	3,390	4,320
Limestone	r 164,374	160,789	143,953
Sulfur:			
Elemental [4]	r 2,723	2,764	2,382
Sulfuric acid	7,116	7,127	6,000
Talc and related materials:			
Pyrophyllite	r 1,372	1,396	1,415
Talc	r 136	178	118
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	404	376	370
Coal:			
Anthracite	217	140	92
Bituminous [5]	22,197	20,193	18,907
Lignite	86	75	61
Total	22,500	20,408	19,060
Coke, including breeze:			
Metallurgical coke	44,316	45,632	44,789
Metallurgical coke breeze	1,826	2,512	2,557
Gashouse coke, including breeze	4,715	4,788	4,586
Fuel briquets, all grades	946	1,027	633
Gas, natural:			
Gross production e [6] ____ million cubic feet	104,000	102,000	98,000
Marketed ____ do	102,553	100,434	97,468
Natural gas liquids:			
Natural gasoline ____ thousand 42-gallon barrels	44	41	37
Liquefied petroleum gas from natural gas (from field plants only) ____ do	151	172	120
Peat e	70	70	70
Petroleum:			
Crude oil ____ thousand 42-gallon barrels	5,141	4,935	4,433
Refinery products:			
Gasoline:			
Aviation ____ do	342	226	229
Other ____ do	169,154	168,443	129,766
Jet fuel ____ do	26,048	20,254	20,950
Kerosine ____ do	144,570	139,126	129,718
Distillate fuel oil ____ do	226,234	224,980	215,094
Residual fuel oil ____ do	764,062	742,364	690,005
Lubricants ____ do	17,762	15,857	12,810

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities—Continued
(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other:			
Asphalt and bitumen thousand 42-gallon barrels	31,661	28,476	25,746
Liquefied petroleum gas do	51,607	51,359	27,612
Naphtha do	196,586	191,362	165,718
Paraffin do	1,322	1,150	631
Petroleum coke do	1,185	1,154	1,340
Unfinished oils do	38,361	41,629	36,437
Refinery fuel and losses do	73,039	74,382	160,035
Total do	1,741,933	1,700,762	1,616,091

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Includes (but not limited to) ferromolybdenum, ferrotungsten, ferrovanadium, and silicochromium.
[2] Includes aplite as follows in thousand tons: 1973—497; 1974—490; 1975—324.
[3] Nitrogen content of fertilizer for year ended June 30 of that stated.
[4] Includes native sulfur as well as byproduct sulfur from sulfide ores and the petroleum industry.
[5] Includes a small amount of natural coke.
[6] Includes output from gas mines and coal mines.

TRADE

Japan's foreign trade in 1975 totaled about $113,616 million. Total exports recorded a marginal gain of 0.3% to $55,753 million, the smallest gain in the past 12 years. Imports decreased 6.6% to $57,863 million, the first drop in 13 years.

The United States, the largest single market for Japanese products, received about 20% of total exports. Shipments to the United States were about 13% less than in 1974, principally due to increased demand for steel products. The 10 largest export markets for Japan in 1975 were the United States, Liberia, People's Republic of China, Republic of Korea, Iran, Indonesia, Taiwan, Australia, Saudi Arabia, and the Federal Republic of Germany, in that order.

Fuels, metals, and minerals continued to be important trade items for Japan. The leading metal export was iron and steel products, accounting for almost 75% of the value of all mineral exports and nearly 20% of total commodity exports. Iron and steel exports in 1975 totaled 29.5 million tons, valued at $10,176 million. Imports of important mineral commodities in 1975 were as follows with value in million dollars: Crude oil, 19,644; coal, 3,454; iron ore, 2,198, and nonferrous metal ores, 1,763.

Table 2.—Japan: Exports of mineral commodities [1]
(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal destinations, 1974
METALS				
Aluminum:				
Bauxite and concentrate tons	316	146	860	Republic of Korea 110; Australia 36.
Oxide (alumina) and hydroxide	183	79	57	Taiwan 26; U.S.S.R. 12; Thailand 11.
Fused alumina	6,431	6,054	5,289	Republic of Korea 2,676; Taiwan 2,323.
Metal including alloys, all forms	34	69	136	United States 19; Republic of Korea 7; People's Republic of China 7.
Arsenic trioxide, pentoxide, and acids tons	47	20	6	All to Malaysia.
Beryllium metal including alloys, all forms kilograms	28	(2)	91	All to Taiwan.
Bismuth metal including alloys, all forms tons	531	507	361	Netherlands 324; United States 123; United Kingdom 51.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal destinations, 1974
METALS—Continued				
Cadmium metal including alloys, all forms ---- tons --	1,513	1,606	1,471	Netherlands 1,360; Belgium-Luxembourg 82.
Chromium:				
Chromite ---- do ----	71	244	364	Thailand 150; Republic of Korea 91.
Oxide and hydroxide ---- do ----	1,661	1,361	749	United States 498; Republic of Korea 387; Taiwan 185.
Cobalt and hydroxide ---- do ----	16	12	12	Republic of Korea 5; North Korea 3; Taiwan 1.
Columbium and tantalum, tantalum metal including alloys, all forms kilograms --	545	25,298	8,971	West Germany 17,034; United States 7,496.
Copper:				
Ore and concentrate ---- tons --	--	2,299	4,799	Taiwan 2,293.
Copper sulfate ---- do ----	268	379	1,523	Peru 200; North Vietnam 100; Taiwan 41.
Metal including alloys, all forms --	80	344	117	United States 91; People's Republic of China 34; Taiwan 22.
Iron and steel:				
Ore and concentrate ---- tons --	2	--	--	
Metal:				
Scrap ---- do ----	208,381	301,163	274,759	Republic of Korea 214,129; Taiwan 77,661.
Pig iron including cast iron ---- do ----	108,183	72,070	406,846	Republic of Korea 44,716; Philippines 10,310; United States 7,000.
Sponge iron, powder and shot ---- do ----	7,009	9,079	7,995	Australia 2,165; Brazil 1,335; Republic of Korea 1,332.
Spiegeleisen ----	--	(3)	--	All to United States.
Ferroalloys:				
Ferromanganese ----	26	54	130	United States 39; West Germany 4.
Other ----	24	123	129	United States 79; Netherlands 19; West Germany 9.
Steel, primary forms ----	5,233	7,595	6,360	Republic of Korea 1,170; Argentina 900; United States 829.
Semimanufactures:				
Bars, rods, angles, shapes, sections ----	3,636	7,068	6,328	United States 1,398; People's Republic of China 540; Iraq 509.
Universals, plates, sheets:				
Universals, plates, sheets, uncoated ----	9,274	9,640	8,202	People's Republic of China 1,270; United States 918; Iran 569.
Tinned plates and sheets ----	888	1,049	865	United States 208; People's Republic of China 107; Taiwan 97.
Other coated plates and sheets ----	1,548	1,562	1,465	United States 646; Brazil 89; Iran 61.
Hoop and strip ----	670	734	514	People's Republic of China 85; Republic of Korea 77.
Rails and accessories ----	73	114	240	Republic of Korea 49; Indonesia 13; Brazil 11.
Wire ----	419	511	563	United States 256.
Tubes, pipes, fittings ----	2,980	3,856	4,451	United States 921; People's Republic of China 390.
Castings and forgings, rough ----	12	13	15	United States 7; Singapore 2; Republic of South Africa 1.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities [1]—Continued
(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal destinations, 1974
METALS—Continued				
Lead:				
Ore and concentrate ----- tons --	--	7,405	--	Territory of South-West Africa 7,350.
Oxides ----- do ----	195	66	266	Republic of Korea 52; Taiwan 6.
Metal including alloys, all forms -	5	35	59	Canada 11; U.S.S.R. 7; United Kingdom 4.
Magnesium metal including alloys, all forms ----- tons --	117	1,461	1,791	Netherlands 832; United States 472.
Manganese:				
Ore and concentrate ----- do ----	1,812	4,887	3,976	United States 1,097; Taiwan 629; Syria 550.
Oxides -----	39	36	23	United Kingdom 5; Indonesia 2; Taiwan 2.
Mercury ----- 76-pound flasks --	1,995	958	1,923	Taiwan 310; Indonesia 269; Republic of Korea 248.
Molybdenum metal including alloys, all forms ----- tons --	35	21	9	Hungary 10; Taiwan 3; Republic of Korea 3.
Nickel metal including alloys, all forms ----- do ----	934	1,684	3,378	Republic of Korea 279; United States 257; Thailand 129.
Phosphorus, elemental (red) - do ----	47	72	182	United States 40; Philippines 9.
Platinum-group metals and silver:				
Ore and concentrate ----- do ----	25	--	--	
Waste and sweepings ---- do ----	5	11	1	Mainly to United States.
Metals including alloys:				
Platinum group thousand troy ounces --	214	r 230	168	United States 79; United Kingdom 60; Netherlands 32.
Silver ----- do ----	645	9,976	8,548	United States 5,112; United Kingdom 3,182; Republic of Korea 366.
Selenium, elemental ----- tons --	168	203	318	Netherlands 120; United Kingdom 25; United States 19.
Tin:				
Oxides ----- do ----	191	56	17	United States 35; Brazil 8; United Kingdom 7.
Metal including alloys, all forms ----- do ----	1,555	1,854	573	Italy 541; Taiwan 189; Republic of Korea 162.
Titanium:				
Oxide -----	29	28	33	United States 17; Romania 4; Republic of Korea 2.
Metal including alloys, all forms ----- tons --	2,771	3,629	3,274	United States 2,509; West Germany 380.
Tungsten:				
Ore and concentrate ----- do ----	31	--	--	
Metal including alloys, all forms ----- do ----	64	114	200	U.S.S.R. 26; United States 20; West Germany 18.
Zinc:				
Ore and concentrate ----- do ----	24,550	--	--	
Oxide ----- do ----	889	2,492	3,689	Romania 1,300; Republic of Korea 290; Iraq 185.
Metal including alloys, all forms -	69	133	59	United States 59; Republic of Korea 15; Netherlands 13.
Other:				
Ores and concentrates:				
Of titanium, molybdenum, tantalum, vanadium, zirconium ----- tons --	321	655	4,470	United States 245; Taiwan 138; Thailand 100.
Of base metals, n.e.s - do ----	10	35	--	Taiwan 34.
Ash and residues containing nonferrous metals ----- do ----	9,872	7,130	3,769	Belgium-Luxembourg 2,731; United States 2,357.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities [1]—Continued
(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal destinations, 1974
METALS—Continued				
Other—Continued				
Oxides, hydroxides, peroxides of metals, n.e.s ---- tons --	1,176	2,220	2,067	United States 810; Netherlands 239; Peru 176.
Metals including alloys, all forms:				
Phosphorus and other metalloids ---- do ----	368	502	806	United States 115; Netherlands 91; Australia 87.
Alkali, alkaline-earth, rare-earth metals ---- do ----	120	119	185	Australia 55; Taiwan 46.
Pyrophoric alloys ---- do ----	110	125	77	France 41; Hong Kong 23; Singapore 11.
Base metals including alloys, all forms, n.e.s ---- do ----	8,000	7,464	5,027	United States 2,196; West Germany 1,843; Netherlands 573.
NONMETALS				
Abrasives, natural, n.e.s.:				
Emery ---- do ----	1,491	931	701	Taiwan 543; Republic of Korea 314.
Natural abrasives, n.e.s ---- do ----	703	363	160	Taiwan 283; Republic of Korea 37; People's Republic of China 28.
Dust and powder of precious and semiprecious stones thousand carats --	1,112	1,387	769	United States 1,127.
Grinding and polishing wheels and stones ---- tons --	3,554	3,111	3,090	Taiwan 358; Singapore 308; United States 271.
Asbestos ---- do ----	257	180	2,158	Republic of Korea 104; Taiwan 61.
Barite and witherite ---- do ----	100	--	95	
Boron materials:				
Crude natural borates ---- do ----	150	1,207	507	Australia 816; New Zealand 250; Taiwan 80.
Oxide and acid ---- do ----	121	1,155	343	West Germany 267; Netherlands 194; United Kingdom 185.
Cement ----	857	2,302	4,098	Indonesia 660; Singapore 440; Hong Kong 388.
Chalk ---- tons ----	949	36	--	Singapore 25; Indonesia 11.
Clays and clay products (including all refractory brick):				
Crude clays, n.e.s ---- do ----	62,451	56,733	30,455	Taiwan 20,222; Republic of Korea 7,503; Philippines 6,621.
Products:				
Refractory ---- do ----	92,244	125,901	107,494	Republic of Korea 30,345; Brazil 18,117; Turkey 9,619.
Nonrefractory [4] ---- do ----	54,592	47,814	52,445	United States 10,289; Singapore 5,180; Hong Kong 4,455.
Cryolite and chiolite ---- do ----	18	11	20	All to Taiwan.
Diamond:				
Gem, not set or strung - carats --	8,785	7,460	3,200	Hong Kong 7,005.
Industrial ---- thousand carats --	93	11	4	United States 6; Taiwan 3; Belgium-Luxembourg 2.
Diatomite and other infusorial earth ---- tons --	1,294	981	908	Taiwan 341; Republic of Korea 186; Singapore 159.
Feldspar and fluorspar:				
Feldspar ---- do ----	5,438	7,409	4,495	Taiwan 4,075; Malaysia 1,750; Philippines 828.
Fluorspar, leucite, nepheline, nepheline syenite ---- do ----	18,043	61	343	Sri Lanka 36; Taiwan 20.
Fertilizer materials:				
Crude ---- do ----	2,930	--	--	
Manufactured:				
Nitrogenous [5] ----	3,454	3,005	2,734	People's Republic of China 1,303; India 478; Indonesia 382.
Phosphatic ----	37	24	9	Taiwan 7; Fiji Islands 5; Indonesia 4.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities [1]—Continued
(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal destinations, 1974
NONMETALS—Continued				
Fertilizer materials—Continued				
Manufactured—Continued				
Potassic	2	(6)	6	All to Thailand.
Other, including mixed	166	74	125	Thailand 59; Indonesia 8; Sri Lanka 5.
Ammonia ---- tons	119,919	144,738	279,702	Philippines 113,781; United States 23,352.
Graphite, natural ---- do	440	418	860	Taiwan 127; Pakistan 90; Indonesia 86.
Gypsum and plasters ---- do	2,546	2,843	2,584	Taiwan 1,236; Republic of Korea 643; Philippines 255.
Iodine ---- do	6,265	6,717	5,116	United States 3,094; France 837; United Kingdom 717.
Kyanite and related materials ---- do	10,676	20,768	8,592	Taiwan 12,515; Brazil 3,500; Republic of Korea 2,383.
Lime ---- do	23,317	31,484	81,364	Bismarck Archipelago 28,874; Indonesia 2,318.
Magnesite ---- do	100	1,134	324	Taiwan 682; Thailand 240.
Mica ---- do	171	257	2,068	Republic of Korea 106; Thailand 63; Taiwan 33.
Pigments, mineral, iron oxides, processed ---- do	5,248	12,342	5,746	United States 4,350; Taiwan 2,068; West Germany 1,572.
Precious and semiprecious stones, except diamond:				
Natural ---- thousand carats	222,873	325,231	4,210,384	Republic of Korea 194,804; Taiwan 76,370.
Manufactured ---- do	72,742	112,917	107,606	Republic of Korea 37,628; Netherlands 31,196; West Germany 19,347.
Pyrite (gross weight) ---- tons	3,209	--	--	
Salt and brine ---- do	533	1,120	1,858	Bismarck Archipelago 618; Malagasy Republic 258; Indonesia 111.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	185	331	365	Australia 233; Venezuela 23; United States 19.
Caustic potash, sodic, potassic peroxides	3	4	5	People's Republic of China 1; Australia 1; United States 1.
Stone, sand and gravel:				
Dimension stone ---- tons	1,714	1,529	330	North Korea 1,099.
Dolomite, chiefly refractory grade ---- do	3,193	6,025	7,284	Philippines 5,455; Taiwan 436.
Gravel and crushed rock ---- do	1,922	1,199	1,348	Taiwan 355; Thailand 222; Singapore 156.
Limestone (except dimension)	1,442	1,469	1,439	Australia 1,398.
Quartz and quartzite ---- tons	256	1,165	219	Thailand 463; Taiwan 424; Philippines 172.
Sand, excluding metal bearing ---- do	3,452	1,575	1,134	Taiwan 542; Republic of Korea 351; Philippines 243.
Sulfur:				
Elemental:				
Other than colloidal ---- do	45,051	62,986	117,267	Republic of Korea 53,232; Indonesia 7,114.
Colloidal ---- do	2,421	114	831	Republic of Korea 82; South Vietnam 12.
Sulfur dioxide ---- do	180	181	108	Australia 173.
Sulfuric acid ---- do	176	289	59,871	Indonesia 127; Republic of Korea 49; Guam 31.
Talc and steatite ---- do	829	746	454	Taiwan 329; Malaysia 172; Philippines 81.
Other nonmetals, n.e.s.:				
Crude	5	7	7	Republic of Korea 1; Taiwan 1; Philippines 1.
Slag, dross and similar waste, not metal bearing	25	39	37	Mainly to Republic of Korea.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities [1]—Continued
(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal destinations, 1974
NONMETALS—Continued				
Other nonmetals, n.e.s.—Continued				
Oxides, hydroxides and peroxides of magnesium, strontium, and barium (including magnesia clinker)	94	82	168	Australia 20; Poland 11; Netherlands 11.
Fluorine and bromine kilograms	1,175	8,090	300	People's Republic of China 8,000.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural tons	--	11	--	Brazil 6; Taiwan 5.
Carbon black and gas carbon:				
Carbon black	16	14	21	Singapore 2; Republic of Korea 2; Thailand 2.
Gas carbon kilograms	--	2,551	--	Thailand 2,500.
Coal, all grades, including briquets	24	132	26	Taiwan 109; Republic of Korea 22.
Coke and semicoke	564	656	733	Peru 188; Venezuela 142; Taiwan 81.
Gas, manufactured only tons	1	(7)	2	Mainly to Caroline, Marshall, and Mariana Islands.
Hydrogen, rare gases (helium, neon, krypton, xenon) do	563	442	425	Republic of Korea 139; Thailand 66.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	258	16	4	All to Republic of Korea.
Refinery products:				
Nonbunker:				
Gasoline do	576	26	110	Republic of Korea 26.
Kerosine and jet fuel do	2,398	1,062	66	Indonesia 760; Hong Kong 302.
Distillate fuel oil do	945	495	47	Hong Kong 423.
Residual fuel oil do	1,496	12,574	8,415	Republic of Korea 1,932; Sweden 1,772; Thailand 1,601.
Lubricants do	2,229	4,496	1,828	Republic of Korea 2,839; Taiwan 523; Indonesia 425.
Other:				
Liquefied petroleum gas do	336	85	92	Hong Kong 84.
Naphtha do	647	1,162	677	Venezuela 843; United States 319.
Mineral jelly and wax do	410	315	237	Australia 63; Brazil 51; Republic of South Africa 40.
Bitumen do	128	245	136	Republic of Korea 143; Burma 76.
Unspecified do	229	248	297	West Germany 64; Italy 50; Republic of Korea 48.
Bunker: [8]				
Kerosine and jet fuel do	13,137	NA	NA	NA.
Distillate fuel oil do	10,216	NA	NA	NA.
Residual fuel oil do	111,270	NA	NA	NA.
Other do	428	NA	NA	NA.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	31	51	51	Republic of Korea 22; Netherlands 9; Taiwan 8.

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): 1973—26,471,496; 1974—25,684,534; 1975—12,861,072.
[5] Includes exports of following amounts of urea containing more than 45% nitrogen: 1973—2,454,379 tons; 1974—2,249,275 tons; 1975—2,205,265 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 1973 and 1974.

Table 3.—Japan. Imports of mineral commodities [1]

(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal sources, 1974
METALS				
Aluminum:				
Bauxite and concentrate	5,615	5,311	4,600	Australia 3,155; Indonesia 1,293; Malaysia 780.
Oxide and hydroxide	452	647	561	Australia 633.
Fused aluminum (artificial corundum) tons	565	2,615	598	United Kingdom 1,759; United States 326; France 300.
Metal including alloys:				
Scrap	48	25	29	United States 14; Canada 4; Hong Kong 3.
Unwrought	476	479	378	New Zealand 82; Bahrain 82; Canada 74.
Semimanufactures	28	44	22	United States 17; West Germany 7; Belgium-Luxembourg 5.
Antimony:				
Ore and concentrate tons	13,959	10,857	9,012	Bolivia 6,216; People's Republic of China 1,994; Thailand 907.
Metal including alloys, all forms do	1,248	589	453	People's Republic of China 509; Bolivia 51.
Arsenic:				
Natural sulfides do	5	40	20	All from People's Republic of China.
Trioxide, pentoxide and acids do	1,971	1,082	906	People's Republic of China 575; France 349; United States 102.
Beryllium metal including alloys, all forms kilograms	8,696	3,139	1,922	All from United States.
Bismuth metal including alloys, all forms tons	2	5	2	United States 5.
Cadmium metal including alloys, all forms kilograms	3,984	9,118	1	North Korea 9,000.
Chromium:				
Ore and concentrate	1,164	1,155	1,269	Republic of South Africa 424; India 311; Philippines 127.
Oxide and hydroxide tons	2,016	1,645	1,088	West Germany 937; U.S.S.R. 430; United States 198.
Cobalt:				
Oxide and hydroxide do	944	820	252	Belgium-Luxembourg 807.
Metal including alloys, all forms do	4,657	3,716	1,581	Zaire 2,916; Belgium-Luxembourg 389; United States 157.
Columbium and tantalum:				
Columbium (niobium) ore and concentrate do	2,207	1,900	2,350	Nigeria 1,066; Brazil 550; United States 98.
Tantalum:				
Ore and concentrate do	84	109	62	Australia 42; Zaire 20; Rwanda 10.
Metal including alloys, all forms do	49	66	21	United States 62.
Copper:				
Ore and concentrate	2,973	3,124	2,605	Canada 1,130; Philippines 886; Bismarck Archipelago 381.
Matte, cement copper and native copper	17	16	--	All from Chile.
Copper sulfate tons	152	[2]1,629	242	Peru 697; U.S.S.R. 336; Hungary 243.
Metal including alloys				
Scrap	68	35	39	United States 27; Taiwan 2; Canada 1.
Unwrought	410	303	184	Zambia 148; Chile 61; Australia 21.
Semimanufactures tons	12,355	16,664	1,729	United States 8,833; Yugoslavia 1,598; West Germany 1,500.

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal sources, 1974
METALS—Continued				
Germanium:				
Dioxide ---------- tons --	15	17	4	Belgium-Luxembourg 9; U.S.S.R. 6; West Germany 2.
Metal including alloys, all forms ---------- kilograms --	918	1,029	5	Czechoslovakia 799; U.S.S.R. 220; Belgium-Luxembourg 10.
Indium metal including alloys, all forms ---------- do ----	1,424	7,787	4	U.S.S.R. 3,743; Canada 1,360; United States 1,096.
Iron and steel:				
Ore and concentrate, except roasted pyrite ----------	134,724	141,951	131,749	Australia 99,436; Brazil 19,523; India 17,407.
Roasted pyrite ---------- tons --	--	68	4,173	Portugal 68.
Metal:				
Scrap ----------	5,409	3,559	3,093	United States 2,546; Australia 566; U.S.S.R. 171.
Pig iron including cast iron --	1,547	1,291	355	Australia 312; Republic of South Africa 241; East Germany 129.
Sponge iron, powder and shot -	15	22	9	Sweden 13; United States 7; Italy 1.
Ferroalloys ----------	143	187	90	Republic of South Africa 74; France 23; Norway 20.
Steel, primary forms ----------	142	133	61	Australia 126; Republic of Korea 3; United States 3.
Semimanufactures ----------	85	107	221	Republic of Korea 28; United States 16; Sweden 7.
Lead:				
Ore and concentrate ----------	243	r 218	201	Canada 143; Peru 44; Australia 9.
Oxides ---------- tons --	1,241	2,586	201	Mexico 1,627; Bulgaria 450; United States 360.
Metal including alloys:				
Scrap ---------- do ----	7,928	1,677	1,103	United States 765; South Vietnam 270; Hong Kong 205.
Unwrought ---------- do ----	64,483	36,554	17,202	United States 10,220; North Korea 8,967; Australia 7,542.
Semimanufactures --- do ----	12	13	11	United States 8; West Germany 3; United Kingdom 2.
Magnesium metal including alloys, all forms ---------- do ----	6,593	13,426	4,805	U.S.S.R. 6,444; United States 5,817; Norway 739.
Manganese:				
Ore and concentrate [8] ----------	3,364	9,908	3,740	Republic of South Africa 1,685; India 826; Australia 653.
Oxides ---------- kilograms --	119	5	24	All from West Germany.
Mercury ---------- 76-pound flasks --	15,794	7,687	2,567	Algeria 4,032; Mexico 1,770; Spain 899.
Molybdenum:				
Ore and concentrate ----- tons --	16,613	17,778	12,128	United States 9,393; Canada 5,793; Chile 2,398.
Trioxide ---------- do ----	447	520	90	United States 302; Netherlands 182; Republic of Korea 35.
Metal including alloys, all forms ---------- do ----	289	147	124	United States 88; Austria 28; West Germany 26.

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal sources, 1974
METALS—Continued				
Nickel:				
Ore and concentrate	3,539	4,218	3,397	New Caledonia 3,363; Indonesia 792.
Matte, speiss, similar materials	30	40	27	Australia 17; Canada 17; New Caledonia 5.
Metal including alloys:				
Scrap tons	1,225	1,436	1,535	United Kingdom 567; Taiwan 356; United States 300.
Unwrought do	15,238	16,699	8,639	U.S.S.R. 4,757; Canada 3,644; Republic of South Africa 3,380.
Semimanufactures do	2,369	4,125	1,656	United Kingdom 977; United States 970; West Germany 305.
Platinum-group metals:				
Waste and sweepings value	--	$9,407	$46,061	All from Taiwan.
Metal including alloys, all forms:				
Platinum thousand troy ounces	1,337	1,194	1,563	U.S.S.R. 454; Republic of South Africa 436; United States 147.
Palladium troy ounces	869,846	678,361	441,973	U.S.S.R. 634,244; United States 23,817; Republic of South Africa 15,299.
Rhodium do	17,619	24,574	45,038	U.S.S.R. 22,768; United States 869; United Kingdom 574.
Iridium, osmium, and ruthenium do	21,516	7,715	13,076	United States 3,807; Republic of South Africa 2,921.
Alloys do	30,447	27,514	29,581	United States 12,034; West Germany 10,087; United Kingdom 3,996.
Rare-earth metals:				
Oxides and crude chlorides tons	2,375	2,157	713	India 1,347; United States 296; Brazil 220.
Metal (yttrium, scandium and intermixtures) kilograms	10,190	26,141	1,452	West Germany 20,000; Brazil 6,000.
Selenium, elemental do	4,384	5,493	2,870	Republic of Korea 3,258; Canada 1,450; United States 785.
Silicon tons	11,327	12,241	3,343	Norway 3,867; Canada 1,914; Sweden 1,534.
Silver:				
Ore and concentrate tons	3,770	3,050	3,450	All from Republic of Korea.
Waste and sweepings value	$10,165	$135,286	$15,620	United States $94,635; Republic of Korea $33,615.
Metal including alloys, all forms thousand troy ounces	34,273	30,989	17,053	Peru 12,072; Mexico 9,963; North Korea 2,662.
Tellurium kilograms	4,188	4,005	2,518	U.S.S.R. 3,999.
Tin:				
Ore and concentrate tons	10	3	--	Australia 3.
Oxide do	10	15	13	Australia 7; West Germany 6; United States 1.
Metal including alloys, all forms do	35,831	31,240	22,763	Malaysia 19,255; Indonesia 6,019; Thailand 4,749.
Titanium:				
Ore and concentrate	494	681	444	Canada 165; Malaysia 164; Australia 164.
Slag	78	46	49	All from Canada.
Oxide tons	13,420	9,975	2,363	West Germany 3,614; United States 2,911; France 1,084.
Tungsten:				
Ore and concentrate do	4,563	3,818	2,027	Republic of Korea 1,161; Portugal 499; Thailand 494.
Metal including alloys, all forms do	246	336	22	United States 172; West Germany 100; France 48.

See footnote at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal sources, 1974
METALS—Continued				
Uranium and thorium:				
Ore and concentrate	32	31	30	All from Zaire.
Oxides (compounds of thorium or uranium depleted in U–235) kilograms	61,593	23,839	3,521	United States 10,522; India 10,300; France 3,000.
Metal including alloys, all forms do	315	[4] 4,212	4,440	All from United States.
Vanadium pentoxide tons	2,632	3,099	2,876	Republic of South Africa 1,917; West Germany 933.
Zinc:				
Ore and concentrate	1,205	1,216	946	Canada 378; Peru 317; Australia 227.
Oxide tons	994	3,768	884	United States 1,104; Republic of Korea 855; U.S.S.R. 621.
Metal including alloys, all forms	28	25	22	North Korea 11; U.S.S.R. 5; United States 5.
Zirconium ore and concentrate (including zircon sand) tons	138,013	119,469	85,389	Australia 1,049; Malaysia 5,192; India 2,800.
Other:				
Ore and concentrate of base metals, n.e.s do	1,586	267	114	Brazil 150; Australia 98; India 19.
Ash and residue containing nonferrous metals do	9,499	11,507	13,082	Australia 3,837; India 999; Indonesia 693.
Oxides, hydroxides and pentoxides of metals, n.e.s.[5] do	2,878	3,112	1,977	United States 1,380; U.S.S.R. 634; West Germany 621.
Metal including alloys, all forms:				
Metalloids [6] do	12,166	15,122	5,884	United States 7,052; U.S.S.R. 5,470; Canada 2,482.
Alkali and alkaline-earth metals [7] do	52	223	36	U.S.S.R. 200; United States 21.
Pyrophoric alloys (ferrocerium) do	10	11	9	Australia 3; United Kingdom 2; France 2.
Base metals including alloys, all forms, n.e.s do	612	1,171	770	United States 503; U.S.S.R. 377; United Kingdom 264.
NONMETALS				
Abrasives, naturals, except diamond, n.e.s.:				
Crude do	2,991	5,489	1,284	United States 2,289; India 1,286; People's Republic of China 1,099.
Dust and powder of precious and semiprecious stones kilograms	19,175	17,160	8,975	All from West Germany.
Grinding and polishing wheels and stones tons	456	1,200	524	Taiwan 358; Singapore 308; United States 271.
Asbestos	342	352	253	Canada 137; Republic of South Africa 124; U.S.S.R. 65.
Barite and witherite	42	50	11	People's Republic of China 36; India 8; Thailand 5.
Boron materials:				
Crude natural borates	43	56	18	Turkey 52.
Oxide and acid	17	19	14	United States 12; U.S.S.R. 4; Turkey 2.
Cement	348	77	2	Republic of Korea 72; United States 4.

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodities [1]—Continued
(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal sources, 1974
NONMETALS—Continued				
Clays and clay products:				
Crude clays, n.e.s.:				
Kaolin	342	351	284	United States 193; Republic of Korea 107; U.S.S.R. 34.
Kyanite, andalusite and sillimanite	25	29	24	Republic of South Africa 19; India 7; United States 3.
Other	344	427	283	Republic of Korea 176; United States 132; People's Republic of China 81.
Products:				
Refractory (including nonclay bricks) tons	7,447	15,608	9,099	United States 5,123; People's Republic of China 4,804; West Germany 2,372.
Nonrefractory do	15,537	17,194	13,017	Italy 6,571; Republic of Korea 5,795; Taiwan 1,211.
Cryolite and chiolite do	2,038	1,027	149	Greenland 874; Denmark 153.
Diamond:				
Gem, not set or strung thousand carats	689	562	648	Israel 190; Belgium-Luxembourg 108; India 81.
Industrial stones do	1,157	823	421	United States 228; Belgium-Luxembourg 187; United Kingdom 157.
Powder and dust do	9,936	8,121	7,485	United States 4,600; Ireland 1,534; United Kingdom 933.
Diatomite and other infusoral earth tons	4,442	4,582	4,151	United States 4,511; Denmark 60.
Feldspar, leucite, nepheline and nepheline syenite do	9,881	20,633	5,091	People's Republic of China 16,858; India 1,450.
Fertilizer materials:				
Crude:				
Nitrogenous (natural sodium nitrate) do	209	223	--	All from People's Republic of China.
Phosphatic	3,190	3,845	2,904	United States 2,162; Morocco 660; Sahara 327.
Potassic tons	--	781	--	All from West Germany.
Manufactured:				
Nitrogenous	37	36	6	Chile 31; Netherlands 4.
Phosphatic	20	9	6	All from United States.
Potassic	1,322	1,520	1,369	Canada 717; U.S.S.R. 317; West Germany 167.
Mixed	97	121	78	United States 106; Canada 10.
Ammonia tons	2	8	8	All from United States.
Fluorspar	574	541	363	Thailand 188; People's Republic of China 179; Republic of South Africa 127.
Graphite, natural	66	86	58	Republic of Korea 53; North Korea 20; U.S.S.R. 7.
Gypsum and plaster	207	111	15	Mexico 61; Australia 32; Morocco 15.
Magnesite and magnesia clinker	52	99	67	North Korea 65; People's Republic of China 24; U.S.S.R. 9.
Mica, all forms	10	10	6	India 5; Republic of Korea 2; Malaysia 1.

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal sources, 1974
NONMETALS—Continued				
Pigments, mineral, including processed iron oxides ------ tons --	3,950	3,297	2,370	West Germany 2,226; United States 390; India 100.
Precious and semiprecious stones, except diamond:				
Natural ---------------- do ----	1,506	1,173	1,144	Brazil 755; India 159; Republic of South Africa 78.
Manufactured ----------- do ----	19	27	49	United States 25.
Pyrite (gross weight) ------- do ----	25,867	65,535	55,887	Philippines 65,516.
Salt ------------------------------	7,275	7,749	6,302	Australia 3,612; Mexico 3,319; People's Republic of China 817.
Sodium carbonate, natural --- tons --	5	--	--	
Sodium and potassium compounds, n.e.s.:				
Caustic soda ------------ do ----	75,037	39,954	23,544	United States 19,052; Italy 6,427; West Germany 5,673.
Caustic potash, sodic and potassic peroxides ------------- do ----	r 2,252	124	(8)	United States 88; Sweden 24; West Germany 12.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked ----	462	489	259	Republic of South Africa 136; Republic of Korea 105; India 76.
Worked --------------------	27	33	19	Republic of Korea 13; Italy 7; Taiwan 4.
Dolomite, including agglomerated dolomite ----------------------	19	28	93	Republic of Korea 26.
Gravel and crushed rock ---------	68	153	71	Taiwan 125; France 11; Republic of Korea 10.
Limestone --------------- tons --	282	405	249	France 385; United States 20.
Quartz and quartzite -----------	170	296	166	Republic of Korea 231; People's Republic of China 23.
Sand, excluding metal bearing ---	535	640	428	Australia 598.
Sulfur:				
Elemental:				
Other than colloidal - tons --	46,409	35,761	--	Canada 22,576; Mexico 13,185.
Colloidal ----------- do ----	323	446	296	United States 347; West Germany 98.
Sulfuric acid ----------- do ----	60,086	51,870	14	Taiwan 29,807; Australia 19,913.
Talc, steatite, soapstone, pyrophyllite -	277	299	236	People's Republic of China 203; North Korea 40; Republic of Korea 30.
Other nonmetals, n.e.s.:				
Crude:				
Meerschaum, amber and jet ------ kilograms --	--	15	40	Poland 12; West Germany 3.
Unspecified ------------------	283	709	228	Republic of South Africa 413; Republic of Korea 142; Philippines 81.
Slag, dross and similar waste and ash, including kelp, not metal bearing ----------------------	164	212	83	United States 104; India 66; Republic of Korea 33.
Oxides, hydroxides, and peroxides of magnesium, strontium and barium --------------- tons --	221	304	122	United States 171; West Germany 91; Ireland 35.
Bromine and iodine ------ do ----	1,187	195	7	Israel 195.
Fluorine ---------- kilograms --	60	26	97	All from United States.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural --------	3	3	2	United States 2; Trinidad 1.
Carbon black -----------------------	8	17	4	United States 11; United Kingdom 2.

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodities [1]—Continued
(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued				
Coal and briquets:				
Anthracite	1,031	1,517	1,026	North Vietnam 664; People's Republic of China 367; North Korea 237.
Bituminous:				
Heavy coking coal, less than 8% ash	22,001	17,623	14,939	United States 11,068; Australia 3,488; Canada 1,049.
Heavy coking coal, more than 8% ash	22,224	31,978	33,030	Australia 12,092; United States 9,366; Canada 8,504.
Other coking coal	11,598	13,033	13,112	Australia 7,293; United States 4,978.
Lignite and lignite briquets	11	22	11	U.S.S.R. 15; Australia 7.
Coke and semicoke	41	238	191	Australia 238.
Gas, hydrocarbon (liquefied natural gas) - thousand 42-gallon barrels	22,583	39,373	52,894	Brunei 28,876; United States 10,497.
Hydrocarbon, helium, rare gases kilograms	89,124	85,568	95,172	United States 85,482.
Peat, including peat briquet and litter tons	8,145	10,043	3,226	U.S.S.R. 5,841; Poland 1,603; Canada 782.
Petroleum:				
Crude and partly refined:				
Crude thousand 42-gallon barrels	1,700,531	1,640,078	1,594,428	Iran 445,881; Saudi Arabia 386,123; Indonesia 240,770.
Partly refined do	121,616	110,959	56,437	Saudi Arabia 89,984; Kuwait 12,464.
Refinery products:				
Gasoline do	1,316	924	741	Singapore 924.
Kerosine and jet fuel do	2,683	3,355	2,434	Singapore 2,670; Bahrain 557.
Distillate fuel oil do	21,623	36,705	21,571	Bahrain 18,490; Singapore 6,272; Kuwait 3,713.
Residual fuel oil do	76,708	63,886	91,284	Indonesia 29,708; Singapore 12,458; Saudi Arabia 3,880.
Lubricants do	1,153	2,662	1,211	United States 1,080; United Kingdom 635.
Other:				
Liquefied petroleum gas do	59,028	65,461	118,816	Singapore 14,979; Kuwait 7,540; Saudi Arabia 6,293.
Naphtha do	37,235	50,270	31,812	Singapore 16,416; Kuwait 9,162; Saudi Arabia 8,264.
Petroleum coke do	10,521	13,371	13,331	United States 12,352.
Unspecified do	1,472	728	239	United States 480; Republic of Korea 132.
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	54	89	83	Republic of Korea 59; United States 30.

[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 additional unreported quantity valued at $747 was also imported.
[5] Includes lithium hydroxide, beryllium oxide, mercury oxide, antimony trioxide, cuprous oxide, 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.—Australia continued to be the principal supplier of bauxite for Japan's aluminum industry. In 1975, shipments of bauxite from Australia totaled 2.9 million tons. Close to 1 million tons of bauxite was imported from Indonesia and about 600,000 tons was supplied by Malaysia. Total imports of bauxite were 4.6 million tons in 1975 compared with 5.3 million tons in 1974.

Production of alumina by four companies in 1975 was 1.6 million tons, down 13.1% from the output in 1974. Output of alumina by company was as follows in tons (figures in parentheses represent shipments during the year): Nippon Light Metal Company, Ltd., 576,259 (595,232); Showa Denko K.K., 459,570 (456,286); Sumitomo Chemical Co., Ltd., 359,088 (402,378); and Mitsui Alumina Co., Ltd., 170,124 (178,070). The largest decline in output was 26.7% by Sumitomo Chemical, followed by Nippon Light Metal, 13.5%, and Mitsui Alumina, 7.8%. Production by Showa Denko was off only slightly from its 1974 level.

Production of primary aluminum metal by 13 smelters of 5 companies was 1.013 million tons in 1975, down 9.3% from that of 1974. Mitsui, with its single smelter at Miike, was the only company that showed a production increase. The remaining four companies reported decreases ranging from 5.7% to 16.7%. Output of metal in 1975 by company was as follows in tons (figures in parentheses indicate output in 1974): Nippon Light Metal, 295,291 (313,237); Showa Denko, 194,651 (209,690); Sumitomo Chemical, 242,777 (273,994); Mitsubishi Chemical Industries Limited, 203,508 (244,552); and Mitsui Aluminium Co., Ltd., 77,032 (76,901). Because of sluggish demand, smelters operated at around 70% capacity throughout the year. Shipments totaled 878,226 tons, down 6.9% from that of 1974, and down 21.9% from peak shipments in 1973. Stocks at yearend were 377,271 tons, 5.6 times that in 1973.

To alleviate the depressed market conditions for the industry, MITI urged a 50% cutback in the production rate beginning in 1976. However, as a compromise the producers agreed to cut back total industry production to an average rate of about 61.5% in an attempt to reduce producers' stocks to 270,000 tons by June 1976. Production rate curtailments by company were proposed as follows beginning in 1976: Nippon Light Metal, 43%; Showa Denko, 34.8%; Sumitomo Chemical, 37.3%; Mitsubishi Chemical Industries, 38.3%; and Mitsui Aluminium, 43.3%.

Production of superpurity aluminum was only 2,966 tons in 1975 compared with 5,630 tons in 1974. Nippon Light Metal suspended operation at its Kambera refinery due to low demand and high inventory. The other producer, Sumitomo Chemical, reduced its operation by closing down eight electrolytic cells to balance its production and shipment of superpurity metal.

Throughout 1975, the aluminum industry was faced with a downturn in demand and a large increase in cost for electric power. It was estimated that 15,000 kilowatt-hours were required to reduce alumina to produce 1 ton of metal ingot. Presently the industrial electric power supplied in Japan costs as much as Y8 per kilowatt-hour, four to eight times the United States and Canadian equivalent of Y1 to Y2. In July 1975, the aluminum smelters proposed a markup of Y46,000 to raise the ingot price to Y326,000 per ton. However, the major industrial users resisted the proposed markup. Additionally, domestic ingot prices continued to be undercut by lower priced imports. The aluminum industry, however, managed to raise the ingot price about Y15,000 per ton. Japanese ingot prices still were higher than the Western equivalents even at the Y15,000 per ton raised level.

Because the Japanese smelters were not price competitive in international trade, smelting ventures abroad, where cheap hydroelectric power is available, were considered desirable. In July 1975, the five primary aluminum producers, a group of Japanese trading companies, and the Indonesian Government concluded an agreement to launch a joint hydroelectric power generation and aluminum smelting venture in northern Sumatra. The Asahan project calls for a hydroelectric powerstation with a maximum capacity of 513,000 kilowatts and an aluminum smelter having an initial annual capacity of 225,000 tons of aluminum.

The Japanese primary aluminum producers and Companhia Vale do Rio Doce (CVRD) of Brazil agreed to construct a 1.3-million-ton alumina plant and a 640,000-ton aluminum reduction plant in Bera de Conde, and a 1.85-million-kilowatt hydroelectric plant in Tucurui on the lower reaches of the Amazon River. With strong urging by the Brazilians, the Japanese Government and the industrial interests concerned decided not to delay the venture despite Japan's recessionary difficulties.

Mitsui Mining & Smelting Co., Ltd., submitted plans to the Solomon Islands Government for mining bauxite and producing alumina on Renell Island. The plans called for the establishment of a joint venture owned 25% by the local government and the balance by Mitsui and its affiliated firms. Bauxite deposits on the island were estimated at nearly 60 million tons. The Government hoped to develop the deposit as a major source for earning foreign exchange.

Copper.—Production of refined copper metal was 818,000 tons, about 178,000 tons below the output in 1974. Domestic shipments amounted to 734,000 tons, an increase of about 15% over those in 1974. However, shipments for export plummeted from 344,000 tons in 1974 to 21,000 tons in 1975. Mitsubishi Metal Corporation ranked first in sales of copper metal with over 190,000 tons, followed by Nippon Mining Co., Ltd., Mitsui Mining & Smelting, Sumitomo Metal Mining Co., Ltd., The Dowa Mining Company, Ltd., Furukawa Mining Co., Ltd., and Toho Zinc Co., Ltd., in that order. Industry stocks at yearend were 166,800 tons, which was equivalent to approximately 2-months' production. In comparison, stocks held at yearend 1974 were 87,000 tons.

During 1975, Japan's modern copper smelting industry was plagued with financial difficulties resulting from over capacity, low copper prices, increased energy and labor costs, and decreased domestic consumption. Nippon Mining cut its monthly production rate to 15,000 tons from its monthly capacity of 27,000 tons in May. Mitsubishi Metal Corporation, Sumitomo Metal Mining, The Dowa Mining, Mitsui Mining & Smelting, and Furukawa Mining were expected to maintain their production curtailment rate of 35% to 40%. Additionally, poor demand for sulfuric acid by the fertilizer industry compounded the difficulties faced by the copper smelters. It was expected that an oversupply of sulfuric acid would also force copper producers to further restrain metal production.

Copper producers were expected to curtail production capacity at their smelter facilities up to 1979. Nippon Mining was expected to totally suspend smelting operations at its Hitachi refinery from October 1976 through March 1978 and concentrate operation at its Saganoseki facility. However, operation of flash furnace No. 1 was expected to be resumed in 1976 at Saganoseki. Smelting operations at Saganoseki have been confined to the No. 2 furnace since December 1974. Mitsubishi Metal Corporation was expected to operate its Naoshima refinery at 65% capacity for the next 3 years. Sumitomo Metal Mining disclosed its decision to keep the capacity of its Toyo refinery unchanged despite an expansion program previously set for fiscal year 1977. Similar reductions in production were made at the Tamano refinery of Hibi Joint Refining Co. and at the Onahama refinery of Onahama Refining Co.

In May 1975, Mitsubishi Metal Corporation resumed commercial operation of its continuous copper smelting process at the Naoshima smelter. This operation had been suspended in January 1975 due to an industrywide production cutback caused by decreased demand for copper. The Mitsubishi process features a multifurnace system which optimizes the oxidation reaction in two stages. Concentrates of copper sulfide ore are first smelted with lance injection of air and fuel to produce the matte and slag, followed by converting the matte by oxidation of the iron and sulfur to produce copper blister. Other features of the Mitsubishi process were as follows: Furnaces were all stationary type; molten products were transferred by gravity to the next furnace through a launder; and the molten products were continuously overflowing through the furnace outlet hole. Reportedly, the advantages of this process over conventional smelting included: (1) High sulfur recovery; (2) compact facilities; (3) low fuel requirements; and (4) elimination of slag flotation.

Agreements were reached between six Japanese copper smelters and three major suppliers of copper ore to raise the treatment charge and refining cost to $0.18

per pound of contained copper in the ore to be shipped in fiscal year 1976. Bougainville Copper Mine of Papua New Guinea, Lornex Copper Mine of Canada, and the Ertsberg Mine in Indonesia annually ship 90,000 tons, 50,000 tons, and 50,000 tons, respectively, of copper ore in terms of copper ingot to Japan under long-term contracts. Similar negotiations are being held with other supply resources which ship ore under individual contracts. Black Mountain of the Philippines which supplied 5,000 tons of copper in terms of copper metal in 1975 agreed to the raise for shipments in the next year. Even with the markup, the Japanese smelters would purportedly still operate at a deficit. Additionally, the $0.18 treatment charge and refining cost rate compared unfavorably with the $0.20 to 0.25 per pound granted to German smelters. Accordingly, the Japanese were expected to continue negotiations to increase the rate.

Mitsui & Co., Ltd., with a 20% interest in the Société Minril de Tenke Fungmel and the Zaire Mining Co. of Japan formed the Zaire Mining Industry Development Co. to develop copper deposits at Musosi and at Kinsenka in Zaire. Nissho-Iwai, a trading firm, was presently cooperating in railway construction between Matadi and Banana.

Mitsui & Co. and Mitsubishi Metal Corporation extended a $70 million loan to Nchanga Consolidated Copper Mines, Limited, for developing the Nchanga open pit copper mine at Chingola, Zambia. Included in the terms of the 10-year contract, which will expire in 1987, were shipments of 100,000 tons of copper ore per year to Japan. Nchanga Consolidated operates copper mines at Chingola and Konkola and has a refinery at Rokana. Mitsubishi Heavy Industries, Ltd., entered into a technical aid agreement with Nchanga Consolidated for the construction of a sulfuric acid plant to recover sulfurous acid gas generated at the Rohana refinery.

Furukawa and Mitsui completed the construction of an electrolytic copper refinery at Ilo, Peru, which was subsequently transferred to Empresa Minera del Perú (Minero Perú). Annual output of metal capacity was rated at 150,000 tons. The Peruvian Government reportedly will expand the Y9,277 million plant to a capacity of 300,000 tons per year.

Iron and Steel.—Japan's steel production of 102.3 million tons in 1975 was 12.6% lower than that of 1974. As the world's third largest steel producer, Japan followed the U.S.S.R. and the United States with 142.0 million tons and 106.0 million tons, respectively. However, Japan continued to be the world's foremost exporter of steel with around 29.5 million tons in 1975.

Japan has 6 of the 10 largest blast furnaces in the world. The other large blast furnaces were located in France, the Netherlands, Italy, and West Germany. The largest is Nippon Steel's Kimitsu Works No. 4, capable of producing more than 11,000 tons of pig iron per day.

As of yearend 1975, Japan's 10 largest blast furnaces were as follows:

Company and blast furnace	Cubic meters	Startup date
Nippon Steel's Kimitsu Works No. 4	4,930	October 1975.
Nippon Kohan'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.

Four Japanese steel companies were among the world's top 10 producers in 1975, headed by Nippon Steel Corporation with output of 32.5 million tons. In comparison, United States Steel Corp. produced 23.9 million tons and British Steel Corp., 15.9 million tons. The next three ranking steel producers were the Japanese firms Nippon K.K., 14.7 million tons; Sumitomo Metal Industries Ltd., 13.4 million tons; and Kawasaki Steel Corporation, 13.3 million tons. August Thyssen Huette A.G. of West Germany with 12.2 million tons, Italy's Finsider Enterprises with 11.5 million tons, and the Netherland-West Germany joint venture ESTEL N.V. with 9.6 million tons rounded out the first 10 companies.

In calendar year 1975, Japan also produced 86.6 million tons of pig iron, 76.8 million tons of hot-rolled ordinary steel, and 7.9 million tons of hot-rolled special steel.

A breakdown of Japan's crude steel output in 1975 is as follows, in million tons: Basic-oxygen furnaces—84.4; electric furnaces—16.7; and open-hearth furnaces—1.1. Output was down from the previous year by 10.9%, 20.1%, and 26.7%, respectively.

Shipments for export during 1975 were 29.9% lower in quantity and 7.9% in value from the previous fiscal period. Of the total shipments, ordinary steel items accounted for 25.1 million tons; special steel items, 1.2 million tons; and others, 4.7 million tons. Among the major destinations, shipments to the United States were first with 5.8 million tons, down 17.4% from that of 1974. The People's Republic of China was second with 3.9 million tons, followed by Iran with 2.4 million tons.

Due to the decline in steel demand, increased inventory, and unsuccessful negotiations for higher prices, the steel industry proposed further cutbacks in production late in the year. Nippon Steel Corporation lowered the operating rate of its blast furnaces to 74%. Operation of the No. 2 blast furnace at the Tobata Works with an internal capacity of 1,906 cubic meters was suspended for repairs and improvements. The operation of blast furnace No. 1 at its Sakai Works was scheduled to be shutdown in February 1976. The startup operation of blast furnace No. 5 of the Oita Works with a capacity of 5,000 cubic meters was expected to be postponed until October 1976.

Kawasaki Steel Corporation postponed the resumption of operation of blast furnace No. 3 at the Mizushima Works to early 1976. Sumitomo decided to postpone the resumption of operation of blast furnace No. 2 at its Wakayama Works by more than 2 months and also announced the suspension of operation of blast furnace No. 1 at Wakayama. Kobe Steel, Ltd., suspended operation of blast furnace No. 1 at its Kobe Works late in 1975.

Nisshin Steel Co., Ltd., began operating No. 1 blast furnace at the Kure Works which had been repaired and remodeled at a cost of Y20,000 million. Its internal capacity is 2,040 cubic meters (originally 1,540 cubic meters). Nisshin spent Y1,700 million in installing air pollution control equipment and Y700 million in water contamination control equipment.

Nippon Kokan continued the construction of its Ogishima Steel Works which was scheduled for completion at yearend 1978. The facility will include two blast furnaces each with an internal capacity of 4,000 cubic meters; two plants each for sintering furnaces and coke ovens; three plants for steel furnaces; plants for blooming, continuous casting, billet, plate, hot rolling, cold rolling; and large-caliber pipe mills. The No. 1 blast furnace was scheduled for completion in March of 1976. Total cost of the complex was estimated at Y850,000 million.

On October 3, Nippon Steel Corporation began operation of the No. 4 blast furnace at the Kumitsu Works. The blast furnace, reportedly the largest in the world, has an internal capacity of 4,930 cubic meters and a production capacity rated at 11,000 tons per day of pig iron. It has a floor diameter of 14 meters. The proposed heat of blast was 1,300° C and the pressure at the top of the furnace was rated at 3 kilograms per square centimeter.

Expansion work on the Kokura Works of Sumitomo Metal Industries was proceeding at a total cost of Y60,000 million and was 60% completed. It is expected that the expansion work will be completed by the end of March 1976. The expansion work includes a new blast furnace with an internal capacity of 1,400 cubic meters. When the complex is completed, the annual production capacity will be 2.7 million tons of crude steel.

Nippon Steel Corporation was completing the present phase of its expansion of the Oita Works which was scheduled for completion near yearend 1976. Blast furnace No. 2 was being installed with an internal capacity of 5,000 cubic meters (output capacity of 12,000 tons per day of pig iron). A sintering furnace, two coke ovens, one converter, two units for continuous casting, and a heavy plate mill were also included in the expansion project. Total cost for the expanded facility was estimated at Y300,000 million.

In late 1975, MITI approved the organization of a Steel Export Cartel to the European Economic Community (EEC). The Cartel, comprised of Nippon Steel, Nippon Kokan, Kawasaki Steel, Sumitomo Metal Industries, Kobe Steel, and Nisshin Steel, represents companies which constitute 90% of Japan's total steel exports to the EEC. The Cartel will function only for the 1976 calendar year and will regulate the export quantity of all steel items, limited to 1.22 million tons, to the EEC. Exports of pig iron and ferroalloys are excluded.

In late 1975, the major steel producers notified overseas suppliers of their option rights to reduce iron ore imports to Japan for fiscal year 1976. Under contracts for fiscal year 1976, a total of 143.8 million tons of iron ore was scheduled for shipment to Japan, as follows, in million tons: Australia, 69.9; Brazil, 23.4; India and Goa, 20.9; Africa, 12.2; and other areas, 17.5. Import shipments had averaged at the 80% to 90% level on volume contracts in the prior years. The import shipments of iron ore were estimated to be about 106 million tons in 1975, 32 million less than 138 million tons imported in fiscal year 1974.

Japan's large iron ore suppliers continued to be mainly Hammersley Iron Pty., Ltd., Mount Newman Iron Ore Co., Mount Goldworthy Mining Ltd., Robe River Mines, Ltd., and The Broken Hill Pty., Ltd., Co. of Australia CVRD and Mineracoes Brasileiras Reunidas of Brazil; and the Mineral and Metal Trading Corporation of India from mines in Goa, Bailadila, and Kiriburu.

C. Itoh & Co. entered into an agreement with Apex Exploration and Mining Co. of the Philippines to import 2.55 million tons of iron sand for a period of 8.5 years beginning in 1977. The iron sand reportedly will be delivered to Nippon Steel Corporation and Kawasaki Steel Corporation. Feasibility studies of the Gonzaca Iron Mine in northern Luzon Island confirmed deposits of 2.9 million tons of iron sand containing 59% iron and 4.5% titanium. A shipping port to be constructed by the Philippine Government at Casabarangan will facilitate shipment of the ore.

After the nationalization of the Marcona Mine operation in Peru, shipments of iron ore to Japan were suspended in July 1975. However, a provisional agreement was made between the Government of Peru and the Marcona Mining Company of the United States for compensation of the mining operation. Minero Perú, a State-owned company, was designated to handle sales of the Marcona iron ore and was expected to begin negotiations with Japanese steel producers for resuming iron ore shipments. In prior years, shipments to Japan of Marcona iron ore totaled between 5 million and 6 million tons annually.

The Industrial Structure Deliberation Council approved a 8.4% capital investment cutback planned by 1,866 industrial companies in fiscal 1975. One hundred and one steel companies have reduced their capital investments by 3.4% or Y46,100 million from their original Y1,346,500 million to Y1,300,000 million based on the construction work started in 1975.

Lead and Zinc.—Japan has been a significant world producer of zinc. Its domestic mine production supplies about one-fourth of the total smelted primary raw materials, and its refined metal output ranks first in the world. Mitsui Mining and Smelting Co., the world's foremost metallic zinc producer with about one-third of Japan's smelting capacity and the famous Kamioka mine, maintained its special role in the zinc economy. However, zinc metal production of roughly 702,000 tons in 1975 was well below the annual output recorded during 1971–74. Zinc exports fell drastically from 133,000 tons in 1974 to 59,000 tons in 1975. Domestic demand was weakened by reduced consumption of zinc for galvanizing. In 1975, only 296,000 tons of zinc was consumed for galvanized coatings compared with 453,441 tons and 400,761 tons in 1973 and 1974, respectively.

Throughout the year, producers curtailed their monthly output and operated generally around 73% of their production capacity. Due to the slump in sales, producers' stocks at yearend were 217,435 tons, equivalent to almost a 3-month production of metal. Additionally, stocks held by consumers and distributors totaled over 35,000 tons.

MITI estimated at the current rate of production and consumption, zinc would be about 125,000 tons in oversupply in the next fiscal year. Hence, the smelters were expected to maintain their production curtailment rate of 30% into 1976 to reduce producer's inventory to the level of 70,000 tons.

To maintain this reduced production

level, Japanese zinc producers held negotiations with foreign zinc ore producers to reduce shipments of ore accordingly. Mount Isa Mines Ltd., of Australia agreed to a 25% reduction of its ore shipment to Japan. Texasgulf of Canada also agreed to reduce its zinc ore shipments to average about 38% for 1976. Negotiations are continuing with Anvil Mining Corp. of Canada to reduce its shipments from 215,000 tons to 150,500 tons in 1976. Despite these drastic cutbacks, total shipment of zinc ore to Japan was expected to be reduced only by 18% for the full year.

In 1975, Nippon Mining, Mitsubishi Metal Corporation, Mitsui Mining & Smelting, Sumitomo Metal Mining Co., The Dowa Mining, and Toho Zinc produced 194,000 tons of lead. Shipments of metal were 208,300 tons, a nominal 1% over 1974. In the second half of 1975, demand for lead began to increase for the manufacture of storage batteries reflecting a rise in automobile production. Also, producers of inorganic chemicals who had all but suspended purchases of lead early in the year began to place orders to replenish stocks. Lead producers were expected to curtail their output by 15% to 20% of total industry capacity. At this rate, industry stocks would probably fall to one-half month production level by yearend, approximately 10,000 tons.

Magnesium.—Production of magnesium metal by Furukawa Magnesium Co., Ltd., and Ube Industries Ltd., in 1975 totaled 8,538 tons, down 4% from the prior year's output. Recovery of secondary metal was 9,227 tons. Forty-six percent of the magnesium consumed was in the production of titanium and zirconium metals. Magnesium used for aluminum alloys constituted 14% of total consumption.

Showa Denko constructed a pilot plant at Chichibu, Saitama, to test a patented thermal magnesium process. The plant was planned to have a capacity of 440,000 pounds per year of metal. Startup of the plant began in midyear.

Manganese.—Although Japan mined about 160,000 tons of low-grade manganese, virtually all the requirements for high-grade manganese ores were met by imports. Japan ranked second to the United States as a producer of electrolytic manganese and manganese oxide. Output of electrolytic manganese in 1975 was 8,265 tons. Producers of electrolytic manganese were Tekkosha Co., Ltd., and Chuo Denko Kogyo, comprising a total capacity of 14,000 tons. Mitsui Mining & Smelting and Daiichi Carbon produced 41,516 tons of manganese oxide. Mitsui Mining & Smelting completed the construction of a manganese dioxide plant at Cork, Ireland. The plant with a 1,000-ton-per-month capacity of manganese dioxide was expected to begin full operation in the spring of 1976. Total cost of construction was estimated at Y7,000 million.

Molybdenum.—Japan imported 12,094 tons of roasted molybdenum concentrates in 1975 compared with 12,280 tons in 1974. Domestic production remained nominal and was 206 tons in 1975. Consumption during the year was 12,491 tons of which 87% was used in the production of briquet and ferromolybdenum.

Nickel.—For lack of indigenous resources, Japan imports all of its nickel needs. During 1975, 8,451 tons of nickel metal (2,168 tons from the U.S.S.R., 2,512 tons from Canada, 1,979 tons from the Republic of South Africa, and 1,792 from Australia, Finland, Norway, and the Philippines); 93 tons of nickel alloy ingot (89 tons from the United States and 4 tons from the United Kingdom); 3,397,000 tons of 1.8% to 2.5% nickel ore (2,492,000 tons from New Caledonia, 872,000 tons from Indonesia, and 26,000 tons from Australia, New Zealand, and the Philippines); 27,442 tons of matte and speiss (16,931 tons from Australia, 8,633 tons from Canada, and 1,878 tons from New Caledonia) were imported. Japan also imported 1,148 tons of semifabricated nickel and alloy products. Japan has a 13% tariff on imported nickel ingot, but ores are not subject to tariff.

Nickel production during the year was 13,019 tons, while ferronickel production was 58,914 tons of contained nickel. Production of nickel and ferronickel dropped 38% and 20%, respectively, from the 1974 output.

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) which produced ferronickel. The combined annual capacity of the five companies totaled about 100,000 tons of nickel in ferronickel. Approximately

98% of the sales of ferronickel, as in the past, was consumed in the production of specialty steel.

Measured in quantity of contained nickel, ferronickel supply was close to five times as important as nickel metal. However, nickel as metal is used in much more diverse applications. The major uses for nickel other than steel alloying were plating, 24%; nonferrous alloying, 13%; fabricated products, 5%; and coinage, 5%.

Japan has two nickel refineries, totaling about a 21,000-ton-per-year capacity—Sumitomo Metal Mining's Niihama plant and Shimura Kako's Tokyo plant. The Matzusaka plant of Tokyo Nickel, Ltd., and the Tsuruga plant of Nippon Nickel Co., Ltd., produced nickel oxide. Shimura Kako announced it will construct a 10,000-ton-per-year nickel refinery in Kikkaido. When completed at yearend 1977, the company's Tokyo refinery would be closed down. The Kakkaido refinery will use advanced technology under license from Inco. Nippon Mining Co. completed the construction of a small refinery at Hitashi to recover 3,000 tons of nickel and 1,000 tons of cobalt annually from mixed cobalt-nickel sulfide ore imported from Australia. Pacific Metals Co.'s plans to erect an 18,000-ton-per-year ferronickel plant at Niigata was postponed for 2 years. The company reportedly invited Nippon Mining, Sumitomo Metal Mining, Shimura Kako, and Nippon Yakin Kogyo to participate in this smelter project.

Because of the weak demand for nickel, the smelters attempted to reduce imports inasmuch as industry stocks were approaching 1.0 million tons at yearend, which was equivalent to about 4-month production. Discussions were held to reduce ore imports from Indonesia's Aneka Tabang by 50,000 tons to 600,000 tons in fiscal year 1976 and also to reduce ferronickel shipments from the Sulawesi smelter from the contracted tonnage of 4,000 to 1,400 tons in the same period. Plans were also being made to reduce imports of New Caledonian nickel by at least 10% to 2 million tons in 1976.

Titanium.—Production of titanium sponge in 1975 was by Osaka Titanium Co., Ltd., Toho Titanium Co., Ltd., and New Metals Industries Company. Despite the removal of consumption controls on oil and power in mid-1974, production of sponge metal in 1975 was 1,331 tons below that of 1974. Exports of sponge metal as in prior years were mainly to the United States. Titanium metal is used primarily for its corrosion-resistant properties. While consumption of titanium was on the upturn during 1972–74, demand slackened in 1975 due to protracted orders in equipment for desalination, petrochemical, and caustic soda plants. Fabricators of titanium metal were Kobe Steel, Nippon Stainless Steel Co., Ltd., and Furukawa Metal Co., Ltd.

Japan has also been prominent as a world producer and exporter of titanium dioxide (titania) and synthetic rutile, using up to 0.5 million tons of imported ilmenite as raw material. There were six titania producers capable of producing about 180,000 tons of TiO_2 per year. The demand for pigments, the primary market for titanium, was hard pressed by sluggish domestic and foreign demand and excessive inventory, and production of titanium was sharply curtailed in early 1975.

Shin-Nanyo Titanium Co., Ltd., a joint venture of Sakai Chemical Industry Co., Ltd., (55%) and Toyo Soda Manufactring Co., Ltd., (45%), agreed to commercialize the production of titanium dioxide by the chloride process developed by Kerr-McGee Corp. A plant facility designed to produce 32,000 tons of titanium per year was to be constructed at Nanyo, Yamaguchi Prefecture.

Klöckner-Sakai, capitalized at Y100 million by Sakai Trading Co., Ltd. of Osaka, Klöckner Werke AG of West Germany, and local Malaysian interests, planned to develop ilmenite deposits in northeast Malaysia. The deposits have been estimated to contain between 2 million and 3 million tons of ilmenite. During the first year of operation, the newly formed company estimated that 10,000 tons of ilmenite would be produced, and beginning with the second year of operation, 50,000 tons would be exported principally to Japan and the balance to Southeast Asia countries.

Tungsten.—Japan produced 1,330 tons of tungsten concentrate in 1975. Awamura Metal Industry Co., Ltd., continued to be the principal domestic ore producer. Imports measured in gross weight of concentrate totaled 2,027 tons in 1975 and 3,818 tons in 1974. Consumption of tungsten fell sharply in 1975 and was estimated at 3,549 tons, down 1,785 tons from 1974. Awamura was the sole ferrotungsten producer, and output in 1975 was only 637 tons. The remainder of the tungsten consumed was 767 tons for calcium tungstate, 2,134 tons for elemental metal, and 10 tons for miscellaneous uses.

Other Metals.—During 1975, Japan produced 1.1 million troy ounces of gold and 8.6 million troy ounces of silver. Output of gold, derived mainly from smelting of imported nonferrous ores, was roughly 1% lower than in 1974. Output of silver was the same as in 1974 and recovery was about one-third from domestic ores. The Dowa Mining Company, at its newly built Kosaka smeltery, started test operations to recover silver from waste sludge generated in the manufacture of photographic film. It was estimated that up to 10 tons of silver could be recovered monthly. Domestic production of platinum and palladium has been nominal, less than 1,000 kilograms, and Japan has had to import 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. Japanese output in 1975 of 2,657 tons was 14% less than that of 1974. The three principal markets for cadmium were batteries, pigments, and as a stabilizer for polyvinyl chloride.

Japan produces only a small quantity of antimony ore and imports antimony in various forms. Output of metal in 1975 totaled about 2,500 tons of which 1,400 tons were produced by Hibino Metal Industrial Corporation, 650 tons by Nihon Mining and Concentrating, and 450 tons by Mikuni Smelting and Refining. Domestic consumption was 2,117 tons in 1975, a 21% decrease from that of 1974. The decreased consumption of antimony was due to the reduced demand from the manufacture of storage batteries, which accounts for about 60% of the total antimony demand. Additionally, battery manufacturers increased consumption of scrap metal in place of primary antimony. Production of antimony trioxide by four companies was 2,850 tons in 1975 compared with 4,400 tons in the previous year. Consumption of antimony trioxide was 2,765 tons, 24% lower than the previous year. Over 50% of the demand was for flameproofing in the electric appliances and automobile industries. Smaller amounts of antimony trioxide, around 840 tons, was used in glassmaking and plastics.

Output of primary and secondary mercury in 1974 was 551 flasks and 189 flasks, respectively. There was no primary production in 1975, and secondary recovery was reported at 3,298 flasks. Imports of mercury dropped from 7,687 flasks to 2,567 flasks in 1975. Consumption declined 21% in 1975 and was attributed mainly to reduced use of mercury in caustic soda manufacture and to reduced use in inorganic chemicals. Exports of mercury were 1,923 flasks, almost equivalent to 75% of total imports during the year.

Production of cobalt during the year totaled 48 tons. Most of the supply was from imports which comprised 1,581 tons. Consumption of cobalt metal has steadily declined; in 1973 consumption was reported as 3,924 tons; in 1974 as 2,806 tons; and in 1975 as 1,979 tons. Reduced demand for cobalt and high-speed steels, heat-resisting alloys, and magnetic alloys accounted mainly for the decline in consumption.

Japan was also an important world producer of other byproduct metals such as bismuth and selenium. Bismuth production and consumption declined; output was 671 tons during 1975 compared with 794 tons in 1974. Consumption of bismuth, estimated at about 350 tons, was primarily for metallurgical additives, ferrites, and alloys. Selenium production moved up 25% to 417 tons. The leading domestic selenium markets were glass, rectifiers, and pigments.

Presently, the only two producers of indium are Nippon Mining and Toho Zinc and output in 1975 was around 550,000 troy ounces. Because of the increase in price for the metal, The Dowa Mining planned to produce indium by mid-1976. Mitsui Mining & Smelting, which suspended production of indium in 1972, reportedly may resume production.

Japan also produced other metals, usually of high purity and generally in quantities prominent by world standards. Output for some of these metals, mostly from imported materials, during 1975 in tons was as follows: Chromium, 2,739; germanium metal, 13; germanium oxide, 12; lanthanum oxide, 21; silicon, 231; and tantalum, 12. Production figures were generally lower than the previous year owing to the worldwide economic recession.

NONMETALS

Cement.—Japan ranks with the United States and the U.S.S.R. as the foremost producers of cement in the world. The Japanese cement industry's capacity increased 6.8 million tons in 1975 to the level of 110 million tons. However, total output of cement during the year was only about 60% of rated capacity. Moreover, production was down 16% from the 73 million tons produced in 1974. Production cutbacks and the increased price of fuel oil pushed up the industry's production cost of cement. Due to curtailments in private plant investments and slackening investments by local governments in public work projects, the cement manufacturers formed a production cartel in November 1975, which would provide temporary production adjustments. Additionally, the cartel was expected to mollify sales competition inasmuch as the producers were loaded with surplus capacity.

Although a series of antirecession measures were enforced by the Government, domestic sales in 1975 totaled 62.8 million tons, a drop of 10% from that of 1974. To make up for sluggish domestic demand, producers began an aggressive program for foreign sales. While shipments for exports remained nominal in terms of industry capacity, exports totaled 4 million tons in 1975, an increase of 88.7% over that in 1974. Exports during the year were primarily to the Middle East and Southeast Asia.

Fertilizer Materials.—Japan's chemical fertilizer industry, second largest in the world, has been highly export oriented. During 1971–74, shipments of nitrogenous fertilizers increased substantially as many countries moved to increase their agricultural production. In 1975, there was a significant turnabout with a sudden drop in exports. Southeast Asian countries, the chief export market for Japanese fertilizer, were suffering with overstocks. Indonesia and the Philippines temporarily refused deliveries of fertilizers during part of the year from Japan.

The People's Republic of China, Japan's single largest customer of chemical fertilizer, successfully negotiated a reduction in import prices. From July–December 1975, the fertilizer industry agreed to an export price of about Y50,000 per ton of urea shipped to China. This represented a reduction of more than Y25,000 from the comparable price for shipments during January to June 1975. Further reductions in price were being negotiated for 300,000 tons of urea and 150,000 tons of ammonium sulfate set for delivery during the first 6 months of 1976.

During 1975, production of various chemical fertilizers were estimated as follows, in thousand tons: Ammonium sulfate, 2,100; urea, 3,700; ammonium chloride, 950; calcium superphosphate, 520; fused magnesium phosphate, 500; and complex fertilizers, 3,900.

Gypsum.—Output of gypsum, primarily as a byproduct in the production of phosphoric acid, was about 2.5 million tons. At yearend, industry-held stocks were estimated at 1.6 million tons. According to MITI, stocks of gypsum were expected to increase annually by about 1.5 million tons mainly because of a rapid increase in recovery of byproduct gypsum in flue gas desulfurization. MITI planned to set up a conference to investigate means to reduce gypsum supply and expand demand.

Salt.—Japan's salt production was 1.01 million tons in 1975 as compared with imports of approximately 6.3 million tons. Breakdown of 1975 imports showed 3.5 million tons from Australia, 2.2 million tons from Mexico, and 0.6 million tons from the People's Republic of China. Aside from salt for human consumption, salt is needed in Japan mainly by the chlor-alkali industry. Consumption of industrial salt in 1975 was estimated at about 5.6 million tons. During the year, Japan produced approximately 2.9 million tons of caustic soda, 1.2 million tons of soda ash, 0.4 million tons of liquid chlorine, and about 0.68 tons of hydrochloric acid (35% grade).

During 1975, Mexico suspended Mitsubishi's salt mining concession on the Baja Peninsula which had been in operation for 10 years. In essence, all exploration and export of salt to Japan was stopped until an accord was reached on a new price agreement. In October, the Japanese industry agreed to a 40% increase in the price of Mexican imports which raised the price from $4.98 to $7.00 per ton.

In December, the Australian Government increased the export price of salt from $6.11 to $7.56 per ton. A further increase to $8.13 per ton was to be levied on January 1, 1976, but a compromise was reached to defer the raise until February. The five salt companies in Western Australia have reportedly suffered accumulated losses totaling about $25 million and claimed the additional increase was needed to make a reasonable profit.

Sulfur.—Production of elemental sulfur from indigenous ores accounts for less than 10% of overall supply. Sulfur recovered from petroleum refining increased about 4% to 749,013 tons in 1975. Japan's large nonferrous metal mining companies and smelters were very prominent in sulfuric acid production. Total production capacity of 56 plants belonging to 41 companies was 10,736,000 tons per year of sulfuric acid in 1975. Due to the decline in demand, producers curtailed output and production totaled 6,000,211 tons. Sulfuric acid is a low-price commodity and is not considered an economic export item. However, inventories were increasing beyond storage capacity and during 1975 about 60,000 tons of acid was shipped primarily to the Republic of South Africa and the Philippines. It was expected that exports of sulfuric acid in 1976 may approach 200,000 tons.

MINERAL FUELS

According to the Resources and Energy Agency of MITI, Japan's total energy supply during fiscal year 1974 (April 1974 through March 1975) reached 3,835.3 trillion kilocalories or 6,609,000 barrels per day in oil equivalents. Of the total energy supply, imported energy accounted for 88.5%, with the balance supplied by domestic energy sources. Japan's reliance on oil accounted for 74.39%. Following oil, in the order of their contribution to the energy supply, were coal, 16.58%; hydropower, 5.42%; and other, 3.16%.

Coal.—Japan's coal mining industry reached its peak in 1960 when output exceeded 55 million tons with about 660 collieries in operation. Subsequently, domestic coal production declined annually. By 1975, production of bituminous coal by eight companies was 18.9 million tons, down 6% from the 1974 output. Production by company in 1975 was estimated in million tons as follows: Mitsui Mining & Smelting Co., Ltd., 7.7; Hokkaido Colliery & Steamship Co., Ltd., 3.5; Taiheiyo Coal Mining Co., Ltd., 2.4; Mitsubishi Coal Mining Co., Ltd., 1.9; Sumitomo Coal Mining Company, 1.5; Matsushima Coal Mining Company, 1.2; Joban Coal Mining Co., Ltd., 0.4; and Kaijima Coal Mining Co., Ltd., 0.25.

Consumption of coal in steelmaking was much more important than for energy production. In 1975, about 60 million tons of coal was consumed by the steel industry of which 95% was provided through imports. During the year, Japan's total coal imports were 62.1 million tons and were primarily from the United States, Australia, and Canada. While imports were down 3% from 1974, the value of imports increased about 20%. Japan's coal import bill was estimated at $3.5 billion in 1975 compared with $2.9 billion in 1974 and $1.4 billion in 1973.

The Coal Mining Council, an advisory group to MITI, recommended that coal production be stabilized at 20 million tons annually. However, the decline in Japan's coal production in 1975 was largely due to the drop in Hokkaido's output. A series of floods, cave-ins, and an explosion during the summer and fall forced the suspension of operation at some of Hokkaido's larger mines. The most serious incident was a gas explosion at the Horonai mine in November; full production was not expected to be restored until March 1977.

To maintain production at the 20-million-ton-per-year level, the council noted that new mines must be developed as marginal ones were closed. In October, a survey team investigated the feasibility of opening new mines in Tempoku, Kushiro, Haboro, and Honbetsu. Preliminary findings revealed that coal was located at excessive depths at Haboro and Honbetsu. The Tempoku and Kushiro Fields contained substantial reserves, 69 million and 49 million tons, respectively. The Tempoku Field was considered attractive for development because its coal was located at shallow depths and suitable for strip mining operations.

In its report, the council also suggested that Japanese mining technology in cooperation with producing nations be used to develop overseas coal and thus provide alternative sources of energy for Japan's need. Additionally, Japan's coal policy should promote research on utilization technology.

Petroleum.—Japan's production of crude oil remained of little consequence, amounting to 4.4 million barrels in 1975, compared with exports of 1,594 million barrels, valued at $19.6 billion. Total industry refinery input during the year was 1,479 million barrels equivalent to 4,054,000 barrels per day input. The 10 largest companies were as follows with input of crude expressed in million barrels: Indemitsu Kosan Co., Ltd., 204; Nippon Petroleum Refining Co., Ltd., 153; Toa Nenryo Kogyo K.K., 121; Maruzen Oil Co., Ltd., 84; Showa Yokkaichi Sekiyu Co., Ltd., 82; Nippon Mining, 72; Koa Oil Co., Ltd., 66; Showa Oil Co., Ltd., 59; Mitsubishi Oil Co., Ltd., 59; and Daikyo Oil, 45. The remainder of crude input, during the year, 534 million kiloliters, was by refineries of 22 other companies.

As of December 31, 1975, Japan had 49 refineries owned by 31 companies, with a total atmospheric distillation capacity of 5,862,360 barrels per day. (Toyo Petroleum Refining Co., Ltd., merged with Nippon Petroleum Refining Co., Ltd., effective November 1, 1975.) Corresponding downstream capacities were as follows, in thousand barrels per day, except as otherwise indicated: Vacuum distillation, 1,805; catalytic cracking, 329; catalytic reforming, 593; middle distillates hydrodesulfurization, 1,195; fuel oil desulfurization, 1,200; hydrocracking, 13; lube oil solvent extraction, 71; lube oil solvent deasphalting, 49; lube oil solvent dewaxing, 61; sulfur recovery, 6,510 tons per day; and liquefied petroleum gas (LPG) recovery, 23,328 tons per day. There were 34 vacuum distillation units, 41 catalytic reforming units, and 19 catalytic cracking units. As of yearend, Japan also had 1,533,000 barrels per day of additional refining capacity under construction or in the planning stage.

Capacities of companies and refineries are as follows:

Company and refinery	Capacity, barrels per day	
	December 1974	December 1975
Asia-Kyoseki: Sakaide	100,000	150,000
Asia Sekiyu:		
Hakodate	25,000	25,000
Yokohama	100,000	100,000
Daikyo Sekiyu: Yokkaichi	195,000	215,000
Fuji Kosan: Kainan	77,600	77,600
Fuji Sekiyu: Sodegaura	210,000	210,000
General Sekiyu:		
Kawasaki	55,000	55,000
Sakai	120,000	120,000
Idemitsu Kosan:		
Aichi	--	130,000
Chiba	310,000	310,000
Hyogo	110,000	110,000
Tokuyama	140,000	140,000
Hokkaido (Tomakomai)	70,000	70,000
Kansai Sekiyu: Sakai	110,000	110,000
Kashima Sekiyu: Kashima	180,000	180,000
Koa Sekiyu:		
Marifu	149,000	149,000
Osaka	80,000	80,000
Kyokuto Sekiyu: Chiba	150,000	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	270,000	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	28,000
Nihon Sekiyu Seisei:		
Kudamatsu	42,000	42,000
Muroran	110,000	110,000
Negishi	330,000	330,000
Nakagsk (Okinawa)	28,000	28,000
Yokohama	70,000	70,000
Okinawa Sekiyu: Henza (Okinawa)	100,000	100,000
Seibu Sekiyu: Yamaguchi	110,000	110,000

Company and refinery—Continued	Capacity, barrels per day	
	December 1974	December 1975
Showa Sekiyu:		
Kawasaki	149,000	149,000
Niigata	43,000	43,000
Showa Yokkaichi: Yokkaichi	310,000	310,000
Taiyo Sekiyu: Kikuma	69,000	69,000
Teiseki Topping: Kubiki	4,410	4,410
Toa Nenryo Kikyo:		
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	100,000	100,000
Total	5,660,360	5,862,360

By the end of fiscal year 1974 (March 31, 1975), Japan's cumulative capital expenditures for the period 1967–75 for oil exploration and development totaled Y461,956 million and Y254,375 million, respectively. In fiscal year 1974, total exploration expenditures were Y158,260 million of which only Y3,475 million was spent on Japan's Continental Shelf. The bulk of the expenditures, Y154,785 million, was used in overseas exploration and were as follows: Middle East, Y107,193 million; Far East and Oceania, Y15,108; Africa, Y9,285 million; North America, Y280; and Central and South America, Y22,919 million. During the same period, the corresponding development expenditures were as follows: Middle East, Y46,340 million; Far East and Oceania, Y15,483 million; Africa, Y1,215 million; North America, none; Central and South America, Y4,126 million.

At yearend 1975, there were 51 Japanese companies involved in 61 exploration and development projects in overseas areas, compared with 11 companies searching for oil and natural gas on Japan's Continental Shelf. Ten companies were successful in finding oil or natural gas and were presently either producing or planning to start commercial production. After successful exploratory drilling in April 1974, United Petroleum Development Company started production of about 30,000 barrels per day at the El Bunduq offshore field on the border of Abu Dhabi and Qatar in December 1975. The other nine successful developers were Abu Dhabi Oil Co., Ltd., Arabian Oil Co., Ltd., C. Itoh Energy Development Co., Ltd., Idemitsu Exploration Co., Ltd. (Japan sea), Japan Low Sulfur Oil Co., Ltd., and Zaire Petroleum Co., Ltd.

Petroleum refinery output was as follows in million barrels (figures in parentheses represent sales of products during the year): Gasoline, 130 (161); naphtha, 166 (184); kerosine, 130 (140); jet fuel, 21 (13); distillate fuel oil, 215 (229); residual fuel oil, 690 (590); and lubricants, 13 (13). Production and sales by six companies represented close to 70% of Japan's total refinery output.

The Petroleum Stockpiling Law was enacted by the National Diet in 1975. Under the provisions of the law, it was mandatory for private petroleum companies to increase their oil stocks and to submit plans for stockpiling to MITI each year. The law called for a 5-year program to stockpile a 90-day emergency supply, of which the first year goal was to be a 70-day stockpile. The total amount of crude oil to be stockpiled in the next 5 years was estimated at 30 million kiloliters, depending upon the rate with which the demand for petroleum increases. Construction of an oil storage base in Oshima, Nagasaki Prefecture, was tentatively proposed. It would have a storage capacity of 18.9 million barrels if built.

In June 1975, the National Diet expanded the jurisdiction of the Japan Petroleum Development Corporation (JPDC). Amendments to the JPDC Charter included the following: (1) Investments in exploration for oil and natural gas would also include tar sand and oil shale overseas and would now include the Continental Shelf of Japan; (2) loans for exploration in overseas areas would be extended to include production and refining, provided that production loans be made only to foreign government agencies engaged in exploration and production in their own territories, that production be linked with the exploration, and that loans for production and refining be also applicable to exploration in the Continental Shelf of Japan; (3) JPDC would be able to acquire exploration rights in overseas areas provided that the rights be transferred to a third party within a certain period; and (4) JPDC would be able to invest money or extend loans for construction of facilities to increase the stockpile of oil.

Sakhalin Oil Development Corporation Company (SODECO), a joint Japanese Government-industry enterprise, was expected to participate in a U.S.S.R.-United States venture to develop undersea oil and natural gas around the coast of Sakhalin off the eastern coast of the U.S.S.R. Prospecting was expected to begin in 1976 and trial drilling in the following year. Natural gas deposits in the area were estimated at 37.5 billion tons in terms of oil and of this amount, between 2.3 billion and 4.5 billion tons were thought to be immediately tappable. Japanese investments in the prospecting phase reportedly were Y4,600 million, of which 70% would be funded by the JPDC.

The Mineral Industry of Kenya, Tanzania, and Uganda

By Janice L. W. Jolly[1] and David G. Willard[2]

KENYA[3]

Mineral development and exploration activity continued to increase in 1975 while Kenya's economy experienced the lowest growth rate in 10 years. Kenya's mineral industry contributed more than $42 million[4] (not including refined petroleum products) to the 1975 gross domestic product (GDP) of about $2,693 million at 1975 prices. Even though imported crude petroleum cost more in 1975, refined petroleum products were fast becoming one of Kenya's major exchange earners, contributing over 20% ($149 million) to trade revenues. Higher import costs, inflation, and stagnating agricultural production prevented the Kenyan economy from achieving more than a 1% GDP growth during 1975. The cost of living index increased 20%. Tightened Government import restrictions, limitations on Government spending, and slackened business activity kept import volume 19% below that of 1974, and the balance of payments deficit was reduced from the 1974 level. Total export value in 1975 was $601 million, and the import value $938.1 million, leaving a $337 million trade deficit. The 1975 import total was $219.6 million less than in 1974. Kenya devalued the shilling by about 15% in the last quarter of 1975.

To adjust to the new economic climate, the Government in mid-1975 modified its basic economic growth strategy by placing greater emphasis on those industrial projects that had low import requirements and high employment potential. Tight credit policies were also implemented, requiring commercial banks: To limit the increase of credit to the private sector to 12% per year and to give priority in granting credit to Government, export businesses, manufacturing, agriculture, and tourism; to give preference to small business needs and to provide no credit to foreign-controlled companies operating outside priority sectors; and to limit credit available to foreign-controlled companies operating mainly in priority sectors to 60% of the foreign exchange investment. Amendments to the Foreign Investment Protection Act, effective January 1976, introduced some uncertainty into the investment guarantee program offered by the Government. Specifically, the Government clarified its intent that the investor rather than Kenya must assume the foreign exchange risks for his investment. The amendments also clarified the Government's refusal to guarantee in advance the repatriation of capital gains realized upon liquidation of an investor's assets. This was not to be confused with guaranteed repatriation of original investment, which was a clear right. The schedule for repatriation of capital profits must be negotiated.[5]

More emphasis was placed on mineral resources in the past few years, resulting in increased mineral development and pros-

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[3] Prepared by Janice L. W. Jolly.
[4] Where necessary, values have been converted from Kenya shillings (K Sh) to U.S. dollars at the rate of K Sh8.25=US$1.00.
[5] U.S. Embassy, Nairobi, Kenya. Foreign Economic Trends and Their Implications for the U.S. State Department Airgram 76-092, July 1976, 11 pp.

pecting activities. Exploration undertaken by the Mines and Geological Department of Kenya was becoming more aggressive, and a policy of encouragement was being pursued with respect to private companies engaging in mineral exploration. Canada was to provide the necessary expertise and equipment for expansion of the Kenya Government's mineral exploration program, under the terms of a $1 million contract signed between the two governments. Included were plans to prospect for lead-silver deposits in Kenya's coastal province and gold and base metals in western Kenya. The Austrian Government spent about $600,000 in the search for minerals; deposits of iron and copper were reportedly found. The Kenya Government has traditionally encouraged foreign investment and was actively seeking foreign partners in a number of projects. In 1975, U.S. business committed $25 million in new investments, bringing the total to $125 million. One of the largest U.S. investments was N-Ren Corp.'s $54 million fertilizer plant started in 1974.

The Kenya Government, in conjunction with the United Nations Development Program (UNDP), initiated an investigation of geothermal resources in the Rift Valley in 1971 and appointed the East African Power and Lighting Co. (EAPLC) as its agent to undertake the work. Since then about $4.1 million has been spent on the investigation of geothermal sources around Naivasha where five holes have been drilled. According to a UNDP report, the presence of sufficient steam for a generating plant was confirmed in the area around Olkaria, some 120 kilometers northwest of Nairobi. As a result, EAPLC was investigating the possibility of installing a pilot atmospheric exhaust turbine plant to produce 1,000 to 1,500 kilowatts of electricity.

Kenya and Sudan agreed to build a highway and railroad that would give the southern Sudan direct access to Mombasa, completely bypassing Uganda because of security risks over the present road through Uganda. The proposed road, to be used for petroleum and explosive supplies, was to join Kitali in Kenya with Juba in southern Sudan and traverse the narrow 100-mile strip of border between the two countries west to Lake Turkana (formerly Lake Rudolph).

PRODUCTION AND TRADE

Production increases were noted for some mineral commodities, such as lime, and fluorite. Fluorite production increased from 38,500 tons produced in 1974 to 54,600 tons in 1975, valued at about $3 million. Hydraulic cement production decreased 0.03%, and was valued at approximately $23.6 million. Calcite, mined in the Kajiado area, was valued at $88,560 for the 150 tons produced in 1975, down from the 300 tons produced in 1974. The entire calcite production was consumed by the domestic ceramics industries for manufacturing eating utensils. Production of magnetite for use in cement decreased from 19,780 tons in 1974 to 16,800 tons in 1975. Other minerals produced included barite, diatomite, gold, guano, galena, salt, soda ash, vermiculite, wollastonite, and gem stones. Less than 10 tons of magnesite were mined since 1973, while mine operators were being changed.

Mineral export values (excluding cement, soda ash, and petroleum refinery products) increased during 1975 to approximately $3.6 million.[6] Fluorite exports were valued at almost $1.8 million, and lead-silver exports were nearly $1.2 million. Total exports in 1975 increased 8%, approximately 45% of manufactured goods was exported to African nations. Among the African countries importing Kenyan refined petroleum products were Burundi, Rwanda, Seychelles, Somalia, Sudan, Zaire, and Zambia. Singapore, Poland, Taiwan, Egypt, Italy, Japan, and the United Kingdom also imported fuel oil from Kenya. Crude oil imports (19.8 million barrels) decreased slightly in 1975 and came mainly from Iran, Saudi Arabia, and Iraq. Internal consumption of all types of fuel also declined throughout 1975, by as much as 20% in the case of industrial diesel oil.

Uganda and Tanzania ranked first and second among Kenya's export markets, although Kenya's trade with these fellow East African Community (EAC) States fell 2% in 1975, a reflection of deteriorating economic conditions in all three states and of a general decline in relative importance of EAC interstate commerce. The fate of the EAC and its 1967 treaty was under a yearlong review by a high-level tristate com-

[6] Mining Annual Review. Kenya, 1976, p. 448.

mittee. Petroleum products accounted for 30% of the exports to these two countries.

Exports to the United States declined in volume in 1974 and 1975, although the value increased. Imports from the United States included $1.4 million of ore-crushing equipment.

Table 1.—Kenya: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
METALS			
Copper, mine output, metal content [e]	70	70	70
Gold, mine output, metal content ---troy ounces	136	235	108
Iron and steel, iron ore, gross weight	[r] 12,543	19,780	16,800
Lead, mine output, metal content	--	[e] 20	20
Silver, mine output, metal content ---troy ounces	6	20	[e] 20
NONMETALS			
Barite	903	442	376
Cement, hydraulic	792,194	878,259	875,352
Clays, kaolin	947	[r] [e] 1,000	[e] 1,000
Diatomite	1,241	1,657	1,799
Feldspar	1,461	2,842	1,616
Fertilizer materials, crude, phosphatic, guano	682	352	297
Fluorspar	48,000	[r] [e] 38,500	54,600
Gem stones, precious and semiprecious:			
Aquamarine ---kilograms	18	NA	NA
Garnet [1] ---do	17	6	NA
Ruby ---do	NA	23	NA
Sapphire ---do	(2)	295	NA
Tourmaline ---do	NA	9	NA
Gypsum and anhydrite [e]	[r] 90,000	100,000	100,000
Lime	32,286	[e] 32,000	197,414
Magnesite, crude	1,517	[e] 10	[e] 10
Salt:			
Crude	[r] 35,564	[r] [e] 35,000	[e] 35,000
Refined	[r] 28,132	30,256	[e] 30,000
Soda ash	[r] 205,800	166,933	91,733
Soda, raw crushed (trona)	4,211	1,546	2,310
Stone, sand and gravel:			
Calcareous:			
Calcite	62	300	150
Coral (for cement manufacture) ---thousand tons	1,774	947	NA
Kunkur (for cement manufacture)	54,712	NA	133,830
Limestone (for cement manufacture)	121,368	NA	181,038
Sand	12,511	17,209	NA
Shale	--	167,240	NA
Vermiculite	871	1,683	7,483
Wollastonite	55	100	60
MINERAL FUELS AND RELATED MATERIALS			
Carbon dioxide, natural	1,666	2,187	NA
Petroleum refinery products:			
Gasoline, motor ---thousand 42-gallon barrels	[r] 2,842	3,034	2,988
Jet fuel ---do	(3)	2,422	3,397
Kerosine ---do	[r] 2,912	561	366
Distillate fuel oil ---do	[r] 3,882	7,224	6,979
Residual fuel oil ---do	[r] 5,655	6,850	6,067
Lubricants ---do	--	--	35
Other:			
Asphalt ---do	301	222	247
Liquefied petroleum gas ---do	[r] 176	201	206
Unspecified ---do	2,962	--	--
Refinery fuel and losses ---do	571	760	761
Total ---do	[r] 19,301	21,274	21,046

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] Quality (gem or industrial) not specified.
[2] Less than ½ unit.
[3] Revised to none.

COMMODITY REVIEW

Metals.—*Chrome and Nickel.*—Chromite and garnierite occur on the slopes of Sekker Mountain in the Sigor Division of the West Pokot District, Rift Valley Province. The chromite deposit at Telot on the southern flank of Sekker Mountain was prospected by trenching and shallow diamond drilling by the Kenyan Mines and Geological Department in 1975. It was estimated that ore reserves were in excess of 59,000 tons with an average grade of 49% Cr_2O_3. The chrome-to-iron ratio was given as 3:1.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys:		
Scrap	(2)	645
Unwrought and semimanufactures value	r $76,102	$353,409
Copper:		
Ore and concentrate (including matte)	143	--
Unwrought and semimanufactures value	$22,536	$30,339
Iron and steel metal:		
Scrap	8,829	5,054
Steel, primary forms	25	--
Semimanufactures:		
Bars, rods, angles, shapes, sections	2,829	3,016
Universals, plates, sheets	r 8,574	7,672
Hoop and strip	109	54
Rails and accessories	15	--
Wire	687	707
Tubes, pipes, fittings	r 748	1,284
Lead:		
Ore and concentrate	--	797
Metal:		
Scrap	--	689
Unwrought and semimanufactures	--	5
Magnesium metal including alloys, scrap	--	7
Zinc metal including alloys:		
Scrap	--	837
Unwrought and semimanufactures	1	50
Other nonferrous metals, scrap, n.e.s	3,223	79
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	r 815	597
Dust and powder of precious and semiprecious stones	--	1
Grinding and polishing wheels and stones value	$918	$943
Barite and witherite do	--	$4,581
Cement	448,922	530,130
Chalk value	--	$8,429
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	18	13
Products	r 165	302
Feldspar and fluorspar	24,885	37,763
Fertilizer materials, manufactured:		
Nitrogenous	1,301	210
Phosphatic	r 117	110
Potassic	10	--
Other including mixed	r 1,689	2
Graphite, natural	2	1
Gypsum and plasters	3 2,394	3,040
Lime	905	1,416
Precious and semiprecious stones, except diamond, natural value	r $309,058	$881,099
Salt and brine	2,147	924
Sodium compounds:		
Caustic soda	231	476
Sodium carbonate, soda ash	204,610	139,869
Stone, sand and gravel:		
Dimension stone, crude and partly worked	(4)	7
Gravel and crushed rock	67	66
Limestone (except dimension)	(5)	63
Sand, excluding metal bearing	20	101
Sulfur:		
Elemental	--	26
Sulfuric acid, oleum	226	11
Other nonmetals:		
Crude, n.e.s value	r $168,008	$498,737
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	64	80
MINERAL FUELS AND RELATED MATERIALS		
Coal, anthracite and bituminous	--	18
Coke and semicoke value	$71	--
Hydrogen, helium, rare gases do	r $97,232	$45,507
Petroleum:		
Crude thousand 42-gallon barrels	--	4
Refinery products: [6]		
Gasoline do	1,634	1,304
Kerosine do	559	523
Jet fuel do	1,469	1,292

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974
MINERAL FUELS AND RELATED MATERIALS—Continued		
Petroleum—Continued		
Refinery products—Continued		
Distillate fuel oil ... thousand 42-gallon barrels	2,092	1,915
Residual fuel oil ... do	6,020	6,397
Lubricants ... do	r 427	448
Other:		
Liquefied petroleum gas ... do	49	36
Nonlubricating oils, n.e.s ... do	1	4
Bitumen and other residues and bituminous mixtures, n.e.s ... do	r 153	101
Unspecified ... do	(4)	1
Total ... do	r 12,404	12,021

r Revised.
[1] Includes transfers to Uganda and Tanzania.
[2] Included with other nonferrous metals.
[3] May include limestone flux and similar stone used for the manufacture of lime or cement.
[4] Less than ½ unit.
[5] Included with gypsum and plasters.
[6] Includes bunkers.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys:		
Scrap	--	5
Unwrought	1	1
Semimanufactures	r 2,706	2,764
Copper metal including alloys:		
Scrap	--	39
Unwrought	21	26
Semimanufactures	r 670	1,038
Gold ... troy ounces	6,277	11,094
Iron and steel:		
Ore and concentrate	10	2
Metal:		
Scrap	391	620
Pig iron, ferroalloys, and similar materials	856	362
Steel, primary forms	24,102	19,569
Semimanufactures:		
Bars, rods, angles, shapes, sections	r 20,644	24,298
Universals, plates and sheets	r 90,792	127,748
Hoop and strip	r 2,496	2,780
Rails and accessories	r 9,420	6,578
Wire	r 12,939	23,244
Tubes, pipes, fittings	r 12,626	12,045
Castings and forgings, rough ... value	$494	$13,172
Lead metal including alloys:		
Scrap	--	2
Unwrought	729	2,209
Semimanufactures	119	[2] 130
Manganese ore and concentrate	1,126	715
Nickel:		
Ore and concentrate	--	10
Metal including alloys:		
Unwrought ... value	--	$802
Semimanufactures	3	[3] 5
Platinum-group metals including alloys, all forms ... troy ounces	3,578	163
Silver metal including alloys ... do	19,280	20,475
Tin metal including alloys:		
Scrap	--	406
Unwrought	33	51
Semimanufactures	329	340
Tungsten metal including alloys, all forms	--	3
Zinc metal including alloys:		
Blue powder	--	16
Unwrought	3,432	5,030
Semimanufactures	1,161	[4] 715

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS—Continued		
Other:		
Ore and concentrates of base metals, n.e.s	([5])	82
Scrap, nonferrous metal, n.e.s.:		
Ash and residue	--	16
Other	303	--
Metals including alloys, n.e.s.:		
Pyrophoric alloys ----value	--	$15,473
Base metals	4	10
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	414	61
Dust and powder of precious and semiprecious stones	--	97
Grinding and polishing wheels and stones	52	6
Asbestos	156	305
Barite and witherite ----value	([6])	$2,305
Cement	16,803	638
Chalk ----value	--	$2,995
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	1,067	1,078
Products:		
Refractory (including nonclay brick)	r 1,511	1,298
Nonrefractory	r 2,145	1,544
Diamond, gem, not set or strung ----carats	--	370
Diatomite and other infusorial earth	--	133
Fertilizer materials:		
Crude:		
Nitrogenous	2,016	--
Phosphatic	80	224
Potassic	([7])	426
Manufactured:		
Nitrogenous	r 76,230	104,268
Phosphatic	r 30,917	35,533
Potassic	r 2,803	3,531
Other including mixed	30,119	34,961
Ammonia	119	94
Graphite, natural	26	1
Gypsum and plasters	[8] 3,988	3,522
Lime	275	90
Magnesite	--	5
Mica:		
Crude including splittings and waste	13	18
Worked including agglomerated splittings ----value	r $816	$6,335
Pigments, mineral, natural, crude ----do	([6])	$122,472
Precious and semiprecious stones, except diamond:		
Natural ----do	r $39,538	$14,792
Manufactured ----do	r $21,033	$24,365
Salt and brine	10,257	28,863
Sodium and potassium compounds, n.e.s.:		
Caustic soda	5,692	6,024
Sodium carbonate (soda ash)	--	7
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	--	25
Worked	47	76
Dolomite, chiefly refractory grade	309	551
Gravel and crushed rock, n.e.s	185	88
Quartz and quartzite	([9])	21
Sand excluding metal bearing	358	836
Sulfur:		
Elemental	653	1,774
Sulfuric acid, oleum	r 961	1,350
Talc, steatite, soapstone, pyrophyllite ----value	--	$102,689
Other nonmetals, n.e.s.:		
Crude ----do	r $123,339	$9,289
Slag, dross and similar waste, not metal bearing from iron and steel manufacture	--	210
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	r 1,952	1,179
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	214	93
Coal, anthracite and bituminous	70,209	66,125
Coke and semicoke	r 1,242	535
Peat including peat briquets and litter	--	2

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974
MINERAL FUELS AND RELATED MATERIALS—Continued		
Petroleum:		
Crude and partly refined ---thousand 42-gallon barrels--	r 20,009	20,667
Refinery products:		
Gasoline ---do----	492	408
Kerosine and jet fuel ---do----	466	665
Distillate fuel oil ---do----	61	528
Lubricants ---do----	r 486	702
Mineral jelly and wax ---do----	11	18
Other:		
Nonlubricating oils, n.e.s ---do----	9	16
Unspecified ---do----	15	10
Mineral tar and other coal-, petroleum-, or gas-derived chemicals -------	1,931	2,822

r Revised.
[1] Includes transfers from Uganda and Tanzania.
[2] Excludes quantity valued at $408.
[3] Excludes quantity valued at $1,368.
[4] Excludes quantity valued at $174.
[5] Quantity valued at $374 not available.
[6] Included in other crude nonmetals.
[7] 100 metric tons credited to Uganda were removed from Kenya leaving a negative balance.
[8] Includes limestone flux and similar stone used for the manufacture of lime or cement.
[9] 55 metric tons credited to Uganda were removed from Kenya leaving a negative balance.

The chromite at Telot is associated with nickel silicate (garnierite).[7] The Mines Department indicated 5.3 million tons of probable reserves with 1% nickel and 14.4 million tons of possible reserves with 0.7% nickel. In 1975, a consortium of Japanese companies (C. Itoh & Co., Nikkon, and Kokan Mining Co.) was granted a license for the chromite-nickel deposits at West Pokot. The license also included precious or semiprecious stones.

Gold.—Small-scale gold mining by the Wananchi people continued in Western Kenya. Four gold mining cooperatives were licensed in 1975 in the Narok, South Nyanza, Bondo, and Kakamega Districts. The United Nations mineral survey of western Kenya completed in the 1960's had recommended that small gold deposits could be worked profitably by local people but did not justify investment by large mining companies. The recommendation was accepted by the Government, and the workings were legalized so that the Wananchi already working the areas could benefit from the advice of technical officers of the Mines and Geological Department. The gold could then be channeled into the country's economy either by export or by sale to local goldsmiths. Licensed Wananchi dealers buy the cooperative's production. There was also some prospecting for gold along the Turkwell River. A small mine also produced some gold on the Nandi Escarpment at Kibigori.

Lead and Silver.—Lead and silver were produced from the Kinagonia mine and valued at nearly $1.2 million for 1975. The mine experienced some technical difficulties and difficult mining ground.[8]

Magnetite.—Magnetite mining continued at Ikutha in the Machakos District and supplied the Bamburi portland cement plant.

Nonmetals.—*Cement.*—The Bamburi Portland Cement Co. was planning an extension to its Mombasa installation to bring the capacity from 800,000 tons per year to more than 1.2 million tons per year. An investment of $23 million was visualized. Foreign orders exceeded 80% of the production capacity in 1975. To export this amount, the company was expanding its fleet of ships. A new ship of 15,000 tons was to start in service transporting clinker to Reunion and returning loaded with coal.[9]

Ceramic Minerals.—Industrial minerals produced by Ceramic Industries of East Africa Ltd., were making ceramics production almost self-sufficient with local materials.

Fluorite.—The Fluorspar Co. of Kenya was established in 1971 by the Industrial and Commercial Development Corp., (ICDC), in partnership with Bamburi Portland Cement Co. and the Continental Ore

[7] Inside Kenya Today (Nairobi, Kenya). West Pokot's Sleeping Bonanza. No. 30, December 1975, pp. 38–39.
[8] Work cited in footnote 6.
[9] Industries et Travaux D'Outremer (Paris). Kenya. V. 24, No. 271, June 1976, p. 483.

Corp. of New York, to develop the fluorite deposits of the Kerio Valley. In 1974. the firm began erecting a new milling facility at a cost of $5 million to process acid-grade fluorite by flotation. The United Kingdom firm, Foster Power Piping Ltd., undertook structural and mechanical construction, while the Nairobi-based Construction and Engineering Building Workers did the sewer construction. The flotation mill was to produce 400 tons of 97.50% acid-grade fluorite every 24 hours, with an operating crew of not more than 10 per shift. Power for the plant was supplied from the EAPLC station at Lessos. The average mill power consumption cost per month was given as about $2,100, depending upon production. Water for the project was pumped from the Mong stream; approximately 6,000 gallons of water circulate through the mill every hour. The tailings were pumped through an 8-inch-diameter pipe to a pond impounded by earthern dikes. Construction was completed in early 1975, and the mill was operated with the help of four Mexican technicians. The company also had an intensive training program to train local staff. An initial 60 workers were undergoing on-the-job training. In 1974, Kenya signed a joint agreement with Japan to supply 250,000 tons of metallurgical and acid-grade fluorite. The company planned to expand the 150,000-ton-per-year mill to double its production by yearend 1977.[10]

The fluorite deposits[11] occur in the Musgut-Kimwarer area of the Kerio Valley in isolated areas within the Basement System of the Mozambique Belt. The deposits are both vein and replacement type. The fluorite bodies were introduced during Miocene volcanic activity as fluorine permeated older sediments and replaced limestone, and rock fragments in fault breccias. Fluorite veins also extend into the overlying younger rift volcanics. Four varieties were reported, including colorless, yellow-brown, dark-gray, and violet fluorite. The colorless variety is dominant. In the region, 11 million tons with an average grade of 50% fluorite were estimated.

Mineral Fuels.—*Coal.*—Exploration for coal by Utah International Co. continued under an exclusive prospecting license, but drilling had not revealed any deposits of consequence in 1975. Further drilling was planned for 1976.

TANZANIA[12]

Mineral production declined in Tanzania in 1975, partly owing to the country's economic difficulties. A severe foreign exchange shortage caused a reduction in imports of fuels and spare parts for the mining industry, resulting in some loss of output and a depressed domestic market for minerals. Diamond again was the leading mineral product, and declines in output of both rough and cut diamonds were responsible for the drop in total value of mineral production. However, revenues from diamond exports increased owing to higher world prices.

As part of its foreign exchange control program, the Government suspended repatriation of all foreign business capital, earnings, and fees beginning in June 1974. No changes in this or other regulations affecting private business occurred during 1975.[13]

The official opening of the Tanzania-Zambia Railway (TAZARA), which had been scheduled for mid-1975, was postponed until 1976 for unannounced reasons. Some traffic, notably Zambian copper, was moving over the line in late 1975. The new rail line was expected to stimulate development of the southwestern part of Tanzania, where deposits of coal, iron, gold, and mica were reported. However, additional export traffic generated by the railway already was creating congestion at the port of Dar es Salaam.[14]

During 1975, mineral exploration and development activity was carried on by the Tanzanian Government, foreign governments, the United Nations, and private industry. Among the more important programs were: Investigations of coal and iron deposits along the TAZARA route by teams

[10] Inside Kenya Today (Nairobi, Kenya). A Step Into the Future. No. 28, June 1975, pp. 22, 23, 29.

[11] Nyambok, I.O., and S.J. Gaciri. Geology of the Fluorite Deposits in Kerio Valley, Kenya. Econ. Geol. Bull., v. 70, No. 2, 1975. pp. 299–307.

[12] Prepared by David G. Willard.

[13] U.S. Embassy, Dar es Salaam, Tanzania. State Dept. Telegrams 923, April 2, 1975, 1 p.; and 2983, August 15, 1975, p. 2.

[14] Economist. Africa From Rhodes to Rail. V. 260, No. 6943, Sept. 25, 1976, p. 88.

U.S. Embassy, Dar es Salaam, Tanzania. State Dept. Airgram A–098, July 4, 1975, p. 1.

from the People's Republic of China to determine the feasibility of establishing an iron and steel industry there; studies sponsored by a consortium of Japanese companies that could lead to the possible development of a soda ash industry at Lake Natron; and joint Tanzanian-Romanian operation of a pilot plant processing metal-bearing beach sands near Dar es Salaam. The State Mining Corp. and the United Nations Development Program also examined deposits of gold, limestone, nickel-cobalt, asbestos, bauxite, and tin and continued a program of geologic mapping. Exploration for diamond was conducted in the Mwadui and Mwanza areas, and the search for petroleum continued offshore.[15]

An agreement establishing an East African Mineral Resources Development Center was reached by representatives of Botswana, Ethiopia, Kenya, the Malagasy Republic, Somalia, Tanzania, and Uganda at a meeting in Addis Ababa, Ethiopia, in February 1975. The agreement had to be ratified by at least three of the signatory Governments in order to become effective. If established, the center, which would be located at Dodoma, Tanzania, would provide assistance in exploration and development studies, laboratory analyses, training, and the collection and publication of mineral statistics.[16]

PRODUCTION

Diamond again dominated mineral production in Tanzania in 1975, accounting for about 90% of the value of all minerals produced. A decline in diamond output caused a drop in total mineral production value of about 15%, reversing the small gain which occurred in 1974. Output of several other commodities also declined, including gem stones other than diamond, and lime. The only major commodity showing a gain was salt, production of which increased 30% in quantity and 62% in value.

Table 4 shows mineral production in Tanzania for 1973–75.

TRADE

Reduced exports and imports of crude petroleum caused a decline in Tanzania's mineral trade in 1975. Crude oil imports fell 55% in quantity and 52% in value; there were no reexports in 1975, whereas 6 million barrels was reexported in 1974. These decreases were largely responsible for reductions of 15% and 31% in the total values of mineral exports and imports, respectively, in 1975 as compared with 1974.

Balances of mineral and nonmineral trade for 1973–75 are shown in the following tabulation, in million dollars:

	1973	1974	1975
Exports:			
Mineral	$60.9	$57.7	$49.2
Nonmineral	301.4	342.9	326.3
Total	362.3	400.6	375.5
Imports:			
Mineral	121.9	246.2	169.6
Nonmineral	365.3	490.2	604.0
Total	487.2	736.4	773.6
Balance of trade:			
Mineral	−61.0	−188.5	−120.4
Nonmineral	−63.9	−147.3	−277.7
Total	−124.9	−335.8	−398.1

Source: East African Customs and Excise Department. Annual Trade Report of Tanzania, Uganda and Kenya, issues of 1973, 1974, and 1975. Mombasa, Kenya, 1974–76.

Statistics on Tanzania's mineral trade for 1973 and 1974 are given in tables 5 and 6.

COMMODITY REVIEW

Metals.—*Gold and Silver.*—Gold production increased 86%, but only a minor amount of byproduct silver was obtained. The continued high price of gold stimulated further exploration by the State Mining Corp. and the United Nations Mineral Resources Division. A small gold deposit was discovered at Buck Reef in the Geita District near Mwanza, and a mine was planned which was to produce 300 kilograms (9,600 troy ounces) of refined gold annually. Gold content of the ore was estimated at 10 grams per ton. Alluvial deposits along the Sira River in the Lupa goldfield near Chunya were also investigated and were believed to be capable of producing 200 kilograms (6,400 troy ounces) of refined gold per year. Diamond drilling of gold deposits was conducted at Saza, also in the Chunya District, and at Rwamagaza and Imweru in the Southwest Mwanza goldfield.

[15] Mining Journal. Tanzania: Striving To Overcome Problems of Development. V. 286, No. 7324, Jan. 2, 1976, p. 5.
Tanzania Ministry of Water Development, Energy and Minerals. Review of the Mining Industry in Tanzania for the Year 1975. Dodoma, Tanzania, Apr. 20, 1976, p. 4.

[16] U.S. Embassy, Addis Ababa, Ethiopia. State Dept. Airgram A-94, May 28, 1975, 2 pp.

Table 4.—Tanzania: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Gold, refined ----troy ounces	56	71	[1] 78
Silver, refined ----do	4	3	[1] 18
Tin, mine output, metal content	r 12	86	--
Tungsten	2	1	(2)
NONMETALS			
Cement	r 314,002	296,400	266,000
Clays, kaolin	870	792	1,004
Diamond:			
Gem e 3 ----carats	r 250,729	249,006	223,902
Industrial e 3 ----do	r 250,730	249,007	223,903
Total ----do	501,459	498,013	447,805
Gem stones, precious and semiprecious, except diamond: [4]			
Amethyst ----kilograms	625	1,092	20
Aquamarine ----do	797	--	5
Beryl (gem only) ----do	59	76	135
Chrysoprase and opal ----do	88	211	--
Corundum (gem only) ----do	(2)	205	4
Garnet ----do	190	349	69
Ruby and sapphire ----do	16	218	2
Scapolite ----do	--	--	13
Tourmaline ----do	9	9	1
Zircon ----do	3	45	7
Zoisite (tanzanite) ----do	77	16	9
Unspecified ----do	2,015	9,776	1,290
Gypsum and anhydrite, crude	12,872	21,124	12,839
Lime (quicklime and hydrated lime)	5,988	4,821	473
Magnesite, crude	109	--	--
Meerschaum	r 9	3	--
Mica, sheet	32	9	6
Salt, all types	38,392	34,177	44,390
Stone, sand and gravel:			
Calcite	r 2,425	2,164	5,390
Ornamental stone:			
Art stone	2	126	3
Amethystine quartz	186	--	(2)
Glass sand	15,233	14,875	28,880
Vermiculite	--	20	--
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous	1,994	1,510	850
Petroleum refinery products:			
Gasoline ----thousand 42-gallon barrels	974	965	767
Kerosine ----do	148	146	127
Jet fuel ----do	445	487	411
Distillate fuel oil ----do	1,289	2,664	2,411
Residual fuel oil ----do	r 2,393	1,258	1,275
Liquefied petroleum gas ----do	76	89	52
Refinery fuel and losses ----do	337	213	324
Total ----do	r 5,662	5,822	5,367

e Estimate. p Preliminary. r Revised.

[1] Exports.

[2] Less than ½ unit.

[3] Estimates based on reported total diamond output and best available information on ratio of gem to industrial stones in total output.

[4] Exports, including transfers to Kenya and Uganda.

Pitting and trenching were carried out at the Sekenke goldfield near Singida.

Iron Ore.—Prospecting teams from the People's Republic of China continued their assessment of iron ore deposits near the TAZARA route in southwestern Tanzania. The Government planned to develop an iron and steel industry in that area based on iron ore deposits at Chunya and Liganga and local coal resources. The Chunya deposits were considered preferable for that purpose. A previously reported $75 million loan from China was to finance the investigation.[17]

Metal-bearing Sands.—Beach Sands Mining Co. Ltd., a joint venture of the Governments of Tanzania and Romania, began operating a pilot plant to process beach sands containing ilmenite, rutile, and zir-

[17] Mining Journal. Tanzania: Striving To Overcome Problems of Development. V. 286, No. 7324, Jan. 2, 1976, p. 5.

Table 5.—Tanzania: Exports and reexports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys:		
Scrap	--	136
Unwrought and semimanufactures	1,990	1,359
Copper metal including alloys:		
Scrap	--	180
Unwrought and semimanufactures	4	--
Gold metal, unworked or partly worked ----troy ounces	15	--
Iron and steel metal:		
Scrap	658	771
Semimanufactures:		
Bars, rods, angles, shapes, section	1,427	100
Universals, plates, sheets	222	4
Rails and accessories	864	11
Wire	43	15
Tubes, pipes, fittings	15,929	6,608
Lead metal including alloys, scrap	--	292
Manganese ore and concentrates	35	180
Silver metal including alloys ----troy ounces	2	--
Tin ore and concentrate	52	68
Zinc metal including alloys, scrap	--	240
Other:		
Ore and concentrate, n.e.s	--	72
Nonferrous metal scrap	924	19
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	--	23
Dust and powder of precious and semiprecious stones	--	97
Cement	11,735	41
Clays, crude, n.e.s	106	76
Diamond, gem, not set or strung ----thousand carats	561	378
Fertilizer materials, manufactured:		
Nitrogenous	2,708	1,281
Phosphatic	5,321	3,143
Other including mixed	2,112	35
Gypsum and plasters [2]	3,534	3,704
Lime	216	10
Magnesite	105	34
Mica, crude, including splittings and waste	18	10
Precious and semiprecious stones, except diamond, natural ----value	r $531,950	$538,286
Salt and brine	r 10,357	8,243
Stone, sand and gravel:		
Dimension stone, crude and partly worked	r 41	--
Quartz and quartzite	4	2
Sand excluding metal bearing	50	(3)
Sulfur:		
Elemental	2,000	--
Sulfuric acid, oleum	113	431
Other nonmetals, n.e.s.:		
Crude ----value	r $1,515	$2,102
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	59	197
MINERAL FUELS AND RELATED MATERIALS		
Coal, anthracite and bituminous ----value	$85	$616
Coke and semicoke	121	20
Petroleum:		
Crude and partly refined ----thousand 42-gallon barrels	3,937	6,140
Refinery products:		
Gasoline ----do	613	176
Kerosine ----do	119	44
Jet fuel ----do	122	56
Distillate fuel oil ----do	983	164
Residual fuel oil ----do	914	1,343
Lubricants ----do	10	25
Other:		
Nonlubricating oils, n.e.s ----do	4	5
Liquefied petroleum gas ----do	6	5
Bituminous mixtures, n.e.s ----do	--	1
Mineral tar and other coal-, petroleum-, or gas-derived chemicals	6	--

r Revised.
[1] Includes transfers to Kenya and Uganda.
[2] Includes limestone flux and similar stone used for the manufacture of lime or cement.
[3] Less than ½ unit.

Table 6.—Tanzania: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys:		
Scrap	--	46
Unwrought	r 2,322	3,348
Semimanufactures	r 819	1,408
Copper metal including alloys:		
Scrap	--	4
Unwrought	6	15
Semimanufactures	363	[2] 284
Gold metal, unworked or partly worked ---troy ounces	843	256
Iron and steel:		
Ore and concentrate	1,158	1,601
Pig iron, ferroalloys, and similar materials	1,330	1,099
Steel, primary forms	6,260	15,272
Semimanufactures:		
Bars, rods, angles, shapes, sections	16,630	20,942
Universals, plates, sheets	34,617	44,927
Hoop and strip	10,265	15,188
Rails and accessories	67,278	32,569
Wire	7,088	5,970
Tubes, pipes, fittings	21,320	13,283
Castings and forgings, rough	--	2
Lead:		
Unwrought	190	47
Semimanufactures	17	46
Nickel metal including alloys, semimanufactures ---value	r $4,000	$4,255
Platinum-group metal including alloys ---do	$32	--
Silver metal including alloys ---troy ounces	1,018	155
Tin metal including alloys:		
Unwrought	20	23
Semimanufactures	3	14
Zinc metal including alloys:		
Blue powder	--	2
Unwrought	3,228	3,686
Semimanufactures	767	527
Other, n.e.s.:		
Ore and concentrate	--	2
Scrap, nonferrous metal	89	3
Base metals including alloys, all forms	17	10
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum etc	100	16
Dust and powder of precious and semiprecious stones	--	13
Grinding and polishing wheels and stones	87	44
Asbestos	194	19
Cement	83,183	64,909
Chalk ---value	--	$32,387
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	1,074	477
Products:		
Refractory (including nonclay brick)	r 1,558	700
Nonrefractory	1,387	1,312
Diamond:		
Gem, not set or strung ---thousand carats	49	47
Industrial ---do	127	--
Diatomite and other infusorial earth	--	39
Feldspar and fluorspar	99	80
Fertilizer materials:		
Crude:		
Nitrogenous	--	297
Phosphatic	38,770	80,186
Manufactured:		
Nitrogenous	29,487	25,069
Phosphatic	4,474	813
Potassic	6,278	6,179
Other including mixed	6,494	12,313
Ammonia	4,045	3,569
Graphite, natural	1	3
Gypsum and plasters	[3] 110	138
Lime	386	589
Magnesite	--	79
Mica:		
Crude including splittings and waste	17	([4])
Worked including agglomerated splittings ---value	r $1,270	$377
Pigments, mineral, natural, crude ---do	--	$16,396
Precious and semiprecious stones, except diamond ---do	r $103	--

See footnotes at end of table.

Table 6.—Tanzania: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Salt and brine	2,042	4,402
Sodium and potassium compounds, n.e.s.:		
Caustic soda	4,391	6,527
Sodium carbonate (soda ash)	1,947	357
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	151	211
Worked	1	20
Dolomite chiefly refractory grade	10	--
Gravel and crushed rock, n.e.s	15	4
Quartz and quartzite	6	14
Sand excluding metal bearing	119	54
Sulfur:		
Elemental	21,355	22,725
Sulfuric acid, oleum	171	363
Talc, steatite, soapstone, and pyrophyllite ----value	--	$90,089
Other nonmetals, n.e.s.:		
Crude ----do	r $162,047	$89,727
Slag, dross and similar waste, not metal bearing, from iron and steel manufacture	--	21
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	r 1,344	1,775
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	4	10
Coal, anthracite and bituminous ----value	r $194	[5] $18,165
Coke and semicoke	228	720
Gas carbon ----value	--	$20,188
Petroleum:		
Crude and partly refined ----thousand 42-gallon barrels	r 10,407	12,039
Refinery products:		
Gasoline ----do	958	132
Kerosine ----do	396	113
Jet fuel ----do	130	20
Distillate fuel oil ----do	1,953	766
Residual fuel oil ----do	227	117
Lubricants ----do	r 137	185
Mineral jelly and wax ----do	r 4	14
Other:		
Liquefied petroleum gas ----do	14	1
Nonlubricating oils, n.e.s ----do	11	20
Bitumen and other residues ----do	r 47	23
Bituminous mixtures, n.e.s ----do	r 64	50
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r 498	857

r Revised.
1 Includes transfer from Kenya and Uganda.
2 Excludes quantity valued at $1,166.
3 Includes limestone flux, and similar stone used for the manufacture of lime or cement.
4 Less than ½ unit.
5 Quantity for 1973 not available; quantity for 1974, 150 tons.

con. The plant was located at Silversands, near Dar es Salaam. Preliminary studies were made of other metal-bearing sands deposits at Mpiji Ndege, also near Dar es Salaam, at Mtwara, and on Pemba Island.

Nonmetals.—*Cement.*—Production of cement was down 10% from the 1974 level, apparently owing to a decline in Government-sponsored construction activity. Projects to expand the Wazo Hill plant and to build new plants at Tanga and Mbeya were expected to be included in the 1976–81 5-year plan. These plants would relieve the cement shortage that has periodically occurred in recent years, when Tanzania has imported an average of 15% of its annual requirements.[18]

Diamond.—Diamond production decreased 4% in quantity and 8% in value in 1975. Two mines accounted for all diamond output: The Mwadui mine, with 92% of the total, and the adjoining New Alamasi mine. Reduced production was partly due to the mining plan at Mwadui, under which lower grade ores were being exploited in order prolong the life of the mine. Reportedly, delays in obtaining replacement parts for the cutting plant at Iringa were also re-

18 U.S. Embassy, Dar es Salaam, Tanzania. State Dept. Airgram A-065, Apr. 28, 1975, p. 1.

sponsible for a drop in the output of cut diamonds, and a stockpile of uncut stones worth about $110 million had accumulated at the plant.

A program of investigating kimberlite deposits in the Mwadui concession area had been initiated by Williamson Diamonds Ltd., the former mine owner, and was carried on by the State Mining Corp. Reconnaisance surveys in 1975 in that area and in the Mabuki area southeast of Mwanza failed to locate any significant diamond occurrences.

Gem Stones.—Production of gem stones declined sharply for the second consecutive year. Most of the production was from mines at Merelani and Longido. The lowered output was attributed mainly to marketing problems experienced by Tanzania Gemstones Industries Ltd., the country's only dealer in precious and semiprecious stones. Exports of gem stones decreased 29% in value and fell from second to third rank in terms of export value among domestically produced minerals. The leading categories in export value were beryl and emerald, garnet and rhodolite, zoisite (tanzanite), and amethyst.[19]

Salt.—Output of salt increased 30%, while exports of salt grew by only 7%. However, the value of salt exports was up 29%, and and salt replaced gem stones as Tanzania's second most important mineral export. All production for export again was from the Uvinza saltworks of Nyanza Salt Mines Ltd. east of Kigoma. An expansion program at the solar-evaporation-type facility was not completed as scheduled in 1975, causing production to fall short of the expected level. Coastal saltworks near Tanga and Mtwara, producing salt for domestic consumption, increased output 51%. A saltworks near Lindi was to be expanded by 69 acres at a cost of about $130,000.

Soda Ash.—A study team from the Japan International Cooperation Agency conducted preliminary studies of the proposed Japan-Tanzania soda ash project at Lake Natron. The agency planned to send another team in 1976 to carry out a feasibility study. Soda ash content of the deposit was estimated to be 100 million tons. Preliminary plans included a refining plant on the lake with an output of 30,000 tons per year and construction of road and railway connections to a port, either at Mombasa, Kenya or Tanga, Tanzania. Total investment was estimated at $340 million. Membership in the joint venture consisted of five Japanese companies and the Tanzanian Government.[20]

Mineral Fuels.—*Coal.*—China and the State Mining Corp. continued to investigate coal deposits in the Songwe-Kiwira and Ruhuhu Fields near the Uhuru Railway in southwestern Tanzania. These deposits were expected to be used in the iron and steel plant proposed for that area. An additional use was under consideration in 1975 when officials of the East African Railways Corp. concluded that the quadrupled cost of imported fuel oil might justify reverting to steam locomotives. These coal deposits were believed to be of suitable quality for locomotive fuel.

Petroleum.—Rising costs and the country's foreign exchange problem caused a drastic curtailment in Tanzania's supply of crude petroleum and refinery products in 1975. Imports of crude oil declined 55%, and exports dropped from 6 million barrels in 1974 to none. Reduced throughput at the country's refinery and a slight increase in exports resulted in a decline in the domestic supply of refinery products.

Exploration for petroleum continued, but no discoveries were made. Azienda Generale Italiani Petroli (AGIP) S.p.A. operator for a combine including the Tanzania Petroleum Development Corp. (TPDC) and American Oil Co., abandoned one offshore well in the Songo Songo Island area and was drilling another at yearend. AGIP also collected seismic and gravity data. TPDC signed a preliminary agreement with the Oil and Natural Gas Commission of India under which the latter may also drill in the Songo Songo Island area. Oceanic Exploration Co. obtained a 15,000-square-mile concession in deep water off the northern coast of Tanzania and began collecting seismic data.[21]

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[19] Tanzania Ministry of Commerce and Industries. General Summary of Mineral Exports. December 1975.
Tanzania Ministry of Water Development, Energy and Minerals. Review of the Mining Industry in Tanzania for the year 1975. Dodoma, Tanzania, Apr. 20, 1976, pp. 2–3.

[20] Japan Chemical Week. Japan-Tanzania Soda Ash Venture To Be Studied Again. V. 17, No. 824, Feb. 12, 1976, p. 5.
———. Natural Soda Ash Venture in Tanzania Being Promoted. V. 15, No. 744, Aug. 1, 1974, p. 1.

[21] U.S. Embassy, Dar es Salaam, Tanzania. State Dept. Telegram 5620, December 1975, p. 1.
World Oil. Tanzania. V. 183, No. 3, Aug. 15, 1976, p. 155.

UGANDA [22]

Mining activity in Uganda appeared to have declined in 1975, continuing a downtrend that began in 1970. Information was not available on many sectors of mining or other economic activity in the country, necessitating considerable use of estimates. Data that were obtained indicated a contraction of economic activity during the year.

Copper remained the country's dominant mineral product in 1975, despite a continuing decline in output. Small-scale production of several other metals continued, although the only production reported was of cassiterite (tin ore). Output of cement dropped, and output of other nonmetallic minerals was estimated to be lower than in 1974 owing to problems encountered in maintaining mining and industrial production.

Mining and industrial production are believed to have been increasingly restricted by shortages of trained manpower and replacement parts. Government decrees in 1972 required the replacement of nonindigenous supervisory personnel by indigenous personnel in all industries and the expulsion of certain nonindigenous groups from the country. Because these nonindigenous groups included many persons having managerial, technical, and maintenance skills, a shortage of these skills resulted; and it is believed that these shortages continued to exist in 1975. In addition, reduced imports of raw materials and replacement parts, which were attributed to a shortage of foreign exchange, are believed to have caused an increased rate of equipment breakdown and a reduction in industrial output in 1975.[23]

PRODUCTION

Statistical data on production were available for only certain minerals in 1975. Production of copper declined 10%, as measured by smelter output of blister copper. Production of cement decreased 2%, and tin production was down 41%. Reported data on the output of other minerals were not available, but it was estimated that shortages of skilled manpower, replacement parts, and transportation had caused a decrease in the production levels of most mines. A decline in exports of mineral commodities in 1975 was further evidence of reduced production, since the majority of the country's mineral output is not consumed domestically.

TRADE

Uganda's total mineral trade rose in 1974 but declined drastically in 1975, according to figures published by the EAC, of which Uganda is a member. Exports of copper

[22] Prepared by David G. Willard.
[23] Torgerson, D. Amin's Economy: A Wobbly Balance. The Washington Post. Apr. 22, 1976, p. 32.
U.S. Bureau of International Commerce. Foreign Economic Trends and Their Implications for the United States: Uganda. ET 73-129, Oct. 7, 1973, p. 5.

Table 7.—Uganda: Production of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Beryllium, beryl concentrate, gross weight e	60	55	55
Bismuth, mine output, metal content e ... kilograms	4,000	4,000	4,000
Columbium and tantalum, ore and concentrate, gross weight e ... do	r 2,800	r 3,500	2,100
Copper:			
Mine output, metal content	15,657	12,243	8,500
Blister, primary	9,692	8,915	8,000
Iron and steel, ingots	15,000	15,000	e 15,000
Tin, mine output, metal content	44	199	e 117
Tungsten, mine output, metal content e	r 109	r 109	109
NONMETALS			
Cement, hydraulic	143,000	153,000	e 150,000
Fertilizer materials, phosphatic:			
Crude, apatite	r 17,000	11,000	10,000
Superphosphate	e 24,000	e 24,000	NA
Lime (quicklime and hydrated lime) e	30,000	30,000	30,000
Salt, evaporated e	3,000	3,000	3,000

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

increased slightly in 1974 but fell sharply in 1975. On the import side, purchases of petroleum refinery products rose moderately in 1974 and declined slightly in 1975, but higher prices boosted the 1975 outlay above that of 1974. Imports of other mineral commodities increased in 1974 and declined steeply in 1975.

Copper remained the country's principal mineral source of foreign exchange, accounting for 84% of the total value of mineral exports in both 1974 and 1975. The value of copper exports declined 46%, amounting to $17.7 million in 1974 and $9.5 million in 1975. Earnings from all other mineral exports—the most important of which were manufactured fertilizers, tungsten, and tin—dropped from $3.5 million in 1975. Imports of petroleum refinery products decreased in 1975, but sharply higher prices raised their total cost to $45.6 million, 43% above the 1974 cost of $32.0 million. Expenditures for other mineral commodity imports totaled $13.4 million in 1974 and $7.2 million in 1975.

The increased total outlay for imported petroleum, combined with lower mineral export revenues, resulted in a sharp increase in the negative balance of mineral trade in 1975. Mineral exports covered 21% of mineral imports in that year, compared with 47% in 1974, and the mineral trade deficit increased 71%. Exports of nonmineral commodities, chiefly coffee, gave the country a positive overall trade balance. Balances of mineral commodity trade and total commodity trade for 1973 through 1975 are shown in the following tabulation, in million dollars:

	1973	1974	1975
Exports:			
Mineral	$18.9	$21.2	$11.3
Nonmineral	290.0	305.3	257.3
Total	308.9	326.5	268.6
Imports:			
Mineral	26.9	45.4	52.8
Nonmineral	132.6	172.4	146.8
Total	159.5	217.8	199.6
Balance of trade:			
Mineral	−8.0	−24.2	−41.5
Nonmineral	157.4	132.9	110.5
Total	149.4	108.7	69.0

Source: East African Customs and Excise Department. Annual Trade Report of Tanzania, Uganda and Kenya, issues of 1973, 1974, and 1975. Mombasa, Kenya, 1974–76.

COMMODITY REVIEW

Metals.—*Copper-Cobalt.*—Copper remained the country's dominant mineral product despite a continuing downtrend in output of the mine at Kilembe, which declined 27% in 1975, its sixth consecutive annual decrease. Smelter production of blister copper was down 10%, implying the use of accumulated stocks to provide part of the smelter feed. Operations at both the mine and the smelter were affected by the industrial production problems described earlier.

The two private owners of the Kilembe mine and its associated smelter at Jinja—Kilembe Copper Cobalt Ltd. (the majority owner) and Commonwealth Development Corp.—sold their interests to the Government in March 1975, giving the Government 100% control of the copper operation.

In 1971 the Government announced plans to establish a processing plant to recover cobalt from a stockpile of cobaltiferous pyrite which had been accumulating at the Kilembe mine. As one of the terms for renewal of the mine lease which expired on December 31, 1973, the Government required that a cobalt plant be constructed by December 31, 1976, but the lessees refused to accept a lease containing that stipulation. Work on a feasibility study for a cobalt extraction unit at Lasese, 8 miles from Kilembe, was reported in 1974. There have been no subsequent reports indicating whether the Government has taken any further action in regard to a cobalt plant.[24]

Other Metals.—Small quantities of beryl, bismuth, columbite and tantalite, cassiterite, and wolframite have been produced by privately-owned mines. These mines are believed to have continued operating on a small scale. The only reported production was of tin (from cassiterite), which declined in 1975 after registering an increase in 1974.

Plans had been announced by the Government in 1971 to investigate ways to expand mineral exploitation in western Uganda, where most metal mines are located, but no developments of this type have since been reported.

Nonmetals.—*Cement.*—Hydraulic cement production decreased 2% in 1975 after increasing 7% in 1974. No explanation was given for the decline, but it was presumed to have resulted from reduced Government investment expenditures.

[24] Engineering and Mining Journal. Uganda. V. 175, No. 7, July 1974, p. 130.
Kilembe Copper Cobalt Ltd. Annual Report 1974. Pp. 3–4.

Table 8.—Uganda: Exports and reexports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal, scrap	--	46
Beryllium, beryl ore and concentrate	84	--
Copper:		
Ore and concentrate	--	2,670
Metal including alloys:		
Scrap	--	49
Unwrought and semimanufactures	9,714	9,002
Iron and steel metal:		
Scrap	332	19
Steel, primary forms	3,713	110
Semimanufactures:		
Bars, rods, angles, shapes, sections	4,400	632
Universals, plates, sheets	164	--
Tubes, pipes, fittings	594	40
Lead metal, scrap	--	107
Tin ore and concentrate	66	243
Tungsten ore and concentrate	178	176
Other:		
Ore and concentrate of base metals, n.e.s	4	9
Scrap, nonferrous metal	83	--
NONMETALS		
Cement	12,248	12,637
Clays and clay products, nonrefractory products	401	10
Fertilizer materials, manufactured:		
Nitrogenous	--	256
Phosphatic	17,290	14,035
Other including mixed	--	463
Quartz and quartzite	--	5
Salt and brine	224	565
Sulfur, sulfuric acid, oleum	962	658
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline ...thousand 42-gallon barrels	15	14
Kerosine ...do	(2)	--
Jet fuel ...do	(2)	--
Distillate fuel oil ...do	r 1	(2)
Other:		
Nonlubricating oils, n.e.s ...do	--	(2)
Bitumen and other residues ...do	--	(2)

r Revised.
[1] Includes transfers to Kenya and Tanzania.
[2] Less than ½ unit.

Table 9.—Uganda: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys, semimanufactures	675	841
Copper metal including alloys:		
Unwrought ...value	--	$450
Semimanufactures	r 240	250
Gold metal, unworked or partly worked ...troy ounces	58	--
Iron and steel metal:		
Scrap	2,823	347
Pig iron, ferroalloys, and similar materials	133	171
Steel, primary forms	r 108	[2] 109
Semimanufactures:		
Bars, rods, angles, shapes, sections	1,598	1,866
Universals, plates, sheets	4,788	9,810
Hoop and strip	959	117
Rails and accessories	1,263	464
Wire	1,494	1,412
Tubes, pipes, fittings	6,552	1,831
Castings and forgings, rough	20	33

See footnotes at end of table.

Table 9.—Uganda: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS—Continued		
Lead metal including alloys:		
Scrap	--	20
Unwrought	--	34
Semimanufactures ......value	$373	$27,359
Nickel metal including alloys, semimanufactures ......do	$971	$2,922
Platinum-group metals including alloys, all forms ......troy ounces	--	1
Tin metal including alloys all forms	7	47
Zinc metal including alloys all forms	332	363
Other:		
Base metals including alloys, all forms. n.e.s ......value	$536	$50
Pyrophoric alloys ......do	--	$135
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	342	10
Dust and powder of precious and semiprecious stones	--	1
Grinding and polishing wheels and stones ......value	$17,215	$179
Asbestos	645	197
Barite and witherite ......value	--	$1,568
Cement	5,357	2,040
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	251	240
Products:		
Refractory (including nonclay brick)	r 1,159	1,308
Nonrefractory	r 215	168
Diatomite and other infusorial earth	--	40
Feldspar and fluorspar	656	694
Fertilizer materials:		
Crude, potassic	100	--
Manufactured:		
Nitrogenous	4,930	3,280
Phosphatic	166	12
Potassic	1,420	(3)
Other including mixed	4,474	4,348
Ammonia	6	12
Graphite, natural	3	23
Gypsum and plasters	4 47	3,538
Lime	309	488
Magnesite	--	10
Mica, worked, including agglomerated splittings ......value	--	$6,406
Pigments, mineral, natural, crude ......do	--	$1,645
Salt and brine	28,884	25,021
Sodium and potassium compounds, n.e.s., caustic soda	2,782	2,298
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	3	3
Worked	r 3	2
Dolomite, chiefly refractory grade	496	318
Gravel and crushed rock, n.e.s	151	91
Quartz and quartzite	11	7
Sand excluding metal bearing	1	76
Sulfur:		
Elemental	2,124	2,591
Sulfuric acid, oleum	1	25
Other nonmetals, n.e.s.:		
Crude ......value	r $89,555	$55,449
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	r 224	205
MINERAL FUELS AND RELATED MATERIALS		
Coke and semicoke	223	229
Petroleum refinery products:		
Gasoline ......thousand 42-gallon barrels	1,018	1,048
Kerosine ......do	348	361
Jet fuel ......do	337	358
Distillate fuel oil ......do	711	627
Residual fuel oil ......do	484	519
Lubricants ......do	58	59
Other:		
Liquefied petroleum gas ......do	31	30
Nonlubricating oils, n.e.s ......do	2	2
Mineral jelly and wax ......do	1	3
Bitumen and other residues and bituminous mixtures, n.e.s ......do	43	31
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	287	7

r Revised.
[1] Includes transfers from Kenya and Tanzania.
[2] Excludes quantity valued at $423.
[3] Less than ½ unit.
[4] Includes limestone flux, and similar stone used for the manufacture of lime or cement.

The Mineral Industry of North Korea

By E. Chin [1]

In 1971, the Democratic People's Republic of Korea launched an ambitious 6-year plan to promote economic construction. To reach its goal of "juche" (self-sufficiency), 60% to 70% of the raw materials required by domestic industry was to be met from indigenous resources to build an independent economy. The mining, metal, and chemical sectors would be key bases for the program. During 1971–74, industrial output reportedly increased 17% per year on the average. In early 1975, the Government advanced the completion date of the plan by 1 year to coincide with the celebration of the 30th anniversary of the Korean Workers' Party. To attain the target levels as set forth in the 6-year plan, the country was reportedly working at "chollima" (flying horse) speed. Late in the year, the Government announced that the targets for electric power generation and coal and chemical fertilizer production had been reached, and that the targets for cement and steel capacity were fulfilled by October 10, the anniversary date. Official announcements further claimed that all targets of the 6-year plan were met, and some were purportedly achieved 16 months ahead of schedule. The value of gross industrial output reportedly had increased 2.2 times over that of the previous plan's final year, 1970. Estimated production, targets of the current plan, and proposed objectives of the next plan for the mineral industry were as follows, in million tons:

Commodity	Output (per year)			Goal (ending year)	
	Prior plan (1970)	Current 6-year plan		Current 6-year plan (1975–76)	Future plan
		(1971)	(1975)		
Steel ingot and castings	2.2	2.4	3.0	3.8–4.0	12
Nonferrous metals	.16	.18	.2	.45	1
Coal	27.5	30.5	45.0	50–53	100
Cement	4.0	4.8	6.5	7.5–8.0	20
Chemical fertilizers	1.5	1.4	2.5	2.8–3.0	5

The primary objectives for 1976, the last year of the current 6-year plan, were to reinforce and maintain the goals achieved thus far and to prepare a new long-term plan. Additionally, the Presidential New Year's address of 1976 stated the following:

"We must exert our efforts for the ferrous metallurgical and cement industries; we must make the maximum use of their existing production capacities and complete the construction projects now under way at the earliest possible date and thus victoriously attain the goals of steel and cement production under the 6-year plan.

"Giving definite priority to the extractive industries is a pressing task in giving full scope to the processing industries, whose productive potentialities have increased radically in recent years and in continuously advancing the nation's econ-

[1] Physical scientist, International Data and Analysis.

omy at a fast rate. In the extractive industries it is imperative to bring about a big upswing in the production of coals and ores; this will be effected through stepping up geological prospecting, giving precedence to tunnelling and earth scraping and quickly completing the comprehensive mechanization of pit work. This year especially great efforts should be directed to the development of the Komdok Mine to increase the output of nonferrous ores markedly."

PRODUCTION

North Korea produced a variety of mineral commodities in 1975, with coal, iron ore, lead, zinc, tungsten, barite, graphite, magnesite, and talc considered to be significant by world production standards. Gold, copper, nickel, pyrite, apatite, and other minerals also were produced. Although North Korea possesses diverse mineral resources, petroleum and natural gas have not been discovered. Official announcements regarding minerals and metals production were vague and no actual output figures were given, only percentage increases over that of the prior plan's goals. The level of production for coal, cement, and chemical fertilizers appeared to have approached the 1976 target.

Table 1.—North Korea: Estimated production of mineral commodities
(Thousand metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 p
METALS			
Cadmium, smelter output ____metric tons__	110	110	110
Copper:			
Mine output, metal content	13	r 13	13
Metal, refined primary	13	r 13	13
Gold, mine output, metal content ____thousand troy ounces__	160	160	160
Iron and steel:			
Iron ore and concentrate	8,900	r 9,400	9,400
Pig iron and ferroalloys [2]	2,700	r 2,800	2,900
Steel, crude	r 2,630	r 2,700	2,800
Steel semimanufactures	2,400	2,500	2,600
Lead:			
Mine output, metal content	90	100	100
Metal, primary	80	95	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	160	r 160	162
Metal, primary	130	130	138
NONMETALS			
Barite	120	120	120
Cement, hydraulic	5,800	r 5,800	6,000
Fertilizer crude, natural phosphate	360	r 400	450
Fluorspar	30	30	30
Graphite	75	75	75
Magnesite:			
Crude	r 1,100	r 1,100	1,100
Clinker	r 600	r 600	600
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	110	120	130
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite	30,000	r 31,000	32,000
Bituminous [3]	7,000	7,900	8,000
Total	37,000	r 38,900	40,000
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 construction materials including miscellaneous clays, glass sand, building sand, stone, and gravel.
[2] Includes granulated iron.
[3] Includes lower-rank coal including lignite.

TRADE

North Korea's cumulative foreign trade debt at yearend 1975 was estimated around \$2.1 billion. Moreover, payments in arrears were reportedly about \$250 million, distributed as follows, in million dollars: Japan, 109.5; United Kingdom, 51.0; Singapore, 38.9; France, 20.6; West Germany, 16.1; Australia, 8.0; Sweden, 4.2; Hong Kong, 1.5; and India and Italy, each with 0.4. The country's balance-of-trade position was strained mainly due to the large expansion in purchases of capital goods and machinery to implement the 6-year plan. In 1975, the trade gap reportedly was widened by the decrease in value of minerals and metals exported by North Korea. Furthermore, North Korea's position in world trade was severely hampered by its mounting trade debt. In April 1975, Sweden claimed that \$4 million was overdue out of total contracts amounting to \$132.5 million and that payments were to be made prior to further shipments. By May, \$3.3 million was reportedly paid. Subsequently, Hermes Export Credit Insurance Co. of West Germany announced that it would no longer insure North Korean purchases. Japan, which supplied a $500 million steel mill located near P'yŏngyang and textile machinery, announced that prior approval would be required by its government for certain future transactions with North Korea.

By 1975, North Korea had established diplomatic relations with 83 countries. During the year, trade protocols were signed with Albania, Bangladesh, Egypt, Iran, Libya, Morocco, Romania, Syria, and Zambia. A trade mission was opened in Lima, Peru, and agreements for economic and technical cooperation were signed with Malta and the Congo (Brazzaville).

Table 2.—North Korea: Apparent exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Cadmium	34	78	All to U.S.S.R.
Copper and alloys, all forms	2,731	467	West Germany 302; Austria 58.
Iron and steel:			
Iron ore and concentrate	423,348	304,533	All to Japan.
Pig iron and cast iron	107,139	106,219	Japan 85,419; U.S.S.R. 20,800.
Ferroalloys	1,242	354	All to Japan.
Steel:			
Primary forms	6,627	179	Do.
Semimanufactures	r 101,108	11,781	Mainly to U.S.S.R.
Lead metal and alloys, all forms	37,840	42,168	U.S.S.R. 15,848; West Germany 13,324; Japan 8,967.
Silver, unworked and partly worked value, thousands	$7,322	$20,068	Japan $11,465; France $4,592; West Germany $3,980.
Tungsten ore and concentrate	23	NA	
Zinc:			
Ore and concentrate	2,822	51,795	Mainly to Japan.
Metal and alloys, all forms	65,729	39,689	Japan 11,451; U.S.S.R. 9,841; France 5,771; Belgium-Luxembourg 5,270.
Other metals and alloys, all forms	134	88	West Germany 32; France 29; Italy 10; Japan 9.
NONMETALS			
Barite	83,444	87,185	All to U.S.S.R.
Cement	495,290	345,000	Do.
Feldspar and fluorspar	7,288	6,371	All to Japan.
Fertilizer materials, crude, nitrogenous	r 15,200	15,000	All to U.S.S.R.
Graphite	17,513	20,360	Mainly to Japan.
Magnesite	524,901	507,065	U.S.S.R. 388,949; Japan 64,665.
Quartz and quartzite	3,855	7,845	All to Japan.
Talc, soapstone, steatite	101,281	88,891	U.S.S.R. 48,603; Japan 40,288.
Other nonmetals, slag and similar materials from steel manufactures	63	NA	
MINERAL FUELS AND RELATED MATERIALS			
Coal and coal briquets	46,056	236,764	All to Japan.

r Revised. NA Not available.

[1] Compiled from the import data of Australia, Belgium-Luxembourg, Canada, Denmark, Finland, France, 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.

Table 3.—North Korea: Apparent imports of mineral commodities [1]
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum metal and alloys, unwrought and semimanufactures	1,788	1,609	Mainly from U.S.S.R.
Chromium and chromite, ore and concentrate	11,000	20,000	All from U.S.S.R.
Iron and steel:			
Ferroalloys	6,848	6,220	Mainly from U.S.S.R.
Semimanufactures	116,820	174,641	Mainly from Japan.
Manganese ore	21,000	21,000	All from U.S.S.R.
Zinc ore and concentrate	10,750	--	
Other:			
Oxides, hydroxides and peroxides of metals	--	3	All from Japan.
Nonferrous metal and alloy semimanufactures	275	270	Mainly from U.S.S.R.
NONMETALS			
Asbestos	4,681	4,572	All from U.S.S.R.
Fertilizer materials, potassium salts	43,200	43,700	Do.
Sulfur, elemental	6,544	6,203	Do.
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades ....thousand tons	269	228	Do.
Coke ....do	122	106	Do.
Hydrogen, helium and rare gases	--	27	Japan 22; France 5.
Petroleum, crude and refinery products thousand tons	585	944	Mainly from U.S.S.R.
Petroleum-, coal-, and gas-derived crude chemicals ....do	r 8	6	All from U.S.S.R.

r Revised.
[1] Compiled from 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.

COMMODITY REVIEW

METALS

Iron Ore and Steel.—Production of iron ore and concentrate in 1975 was estimated at around 9.4 million tons. Almost one-half of the total production was from the Musan mine in North Hamlgyŏng Province, which reportedly has an annual output capacity of 5.5 million tons. Most of the remainder of iron ore production was from the Chaeryŏng, Unyul, and Hasŏng mines in South Hwanghae Province, and the Tŏkhyŏn mine in North P'yongan Province. There was purportedly some production from the new mines at Toksung and Sŏhae-ri, and from mines at Songnam, Yongwon, and Kaech'on.

A 98-kilometer hydraulic pipeline to transport slurried iron ore concentrate from the Musan mine near the Yalu River to the Kimchaek iron and steel works in Chongjin was completed late in the year. The pipeline was built across a mountain ridge more than 1,500 meters above sea level. Transport processes to adjust the hydraulic pressure were automated and were maintained by remote control. Musan is one of the world's largest known iron ore deposits, with reserves estimated at around 1.5 billion tons of high-grade magnetite. Output of the mine was to be expanded further to 6.5 million tons per year. The construction of the pipeline augments the existing railway, and it has become possible to supply larger quantities of ore to the Kimchaek works.

Production of pig iron during the year was about 3.0 million tons. Under the goals of the 6-year plan, output was to be expanded to 3.5 million to 3.8 million tons by 1976. North Korea, which has imported steel sheets, heavy plates, tubes, and other forms from Japan, U.S.S.R., and other countries, hoped to begin exporting steel in 1976.

North Korea's production of steel rose from around 2.2 million tons in 1970 to an estimated 3.0 million tons in 1975. Steel production was from the Ch'ongjin steel plant, Hwanghae iron and steel complex, Kangson steel complex, and the Kimchaek iron and steel works. Plans to increase production to 10 million tons of steel per year by 1980 were progressing through expansion programs and new construction. The Kimchaek expansion, the largest iron and steel complex in North Korea, included the installation of a continuous sintering furnace and a continuous casting bay, a fourth coking furnace, and a mill to produce hot- and cold-rolled products. The Hwanghae iron and steel complex was equipped with an automation and remote control system in its production processes. A telecommunications system was installed to monitor the blast furnaces and to operate the crane for the hot metal ladle. Reportedly the steel shop, screening center, reduced pellet shop, and the sintering facility were entirely automated. The Kangson steelworks, with an annual output capacity of 700,000 tons, was equipped with continuous casting facilities. Construction continued on the steel plant designed by the Japanese at Nampo, which will have an initial production capacity of 1 million tons of steel per year and will subsequently be expanded to 3 million tons.

Nonferrous Metals.—Lead and zinc were the principal nonferrous metals produced in North Korea. In 1975, estimated outputs of lead and zinc metal were 95,000 tons and 138,000 tons, respectively. Gold, silver, copper, nickel, cadmium, and tungsten were also produced although in much smaller quantities.

A lead mine and smelting facility was being built in the Tanchon area on the east coast. Additionally, the lead smelters at Haeju and Munp'yong were being expanded, and extraction circuits to recover precious metal byproducts were being installed. The mine at Songch'on was purportedly being expanded to increase output of lead-zinc ore. The Komdok mine was specifically cited in the New Year's address to increase the production of lead ore.

In 1975, about 13,000 tons of refined copper were produced from indigenous ore. North Korea also imported about 50,000 tons of copper concentrates containing almost 30% copper from Peru during the year for domestic refining. A copper deposit at Hyesan, near the China border, was reportedly being developed. The smelter at Nampo on the west coast was being expanded to increase the production capacity for copper and associated precious metals. A mine was being developed near Sohung purportedly for recovering gold values in the area.

During the year, three small aluminum remelt facilities were in operation at Chinampo, Hungnam, and Tasado. Construction of an aluminum smelter of about 20,000 tons per year capacity was reportedly nearing completion. The plant site was not disclosed.

NONMETALS

Cement.—The drive for industrial construction created a heavy demand for cement. Existing production facilities were being expanded, and new works were planned. Production of cement in 1975 was estimated at 6.0 million tons. Almost half of the output was from the Sunchon cement works in South P'yŏngan Province. The remainder of the production was from the Pongsan, Komusan, Majong, Haeju, Sunghori, Kusong, and the 8th of February works. The Sunchon works, completed in 1973, was undergoing expansion to double its present capacity to 6 million tons per year. A new cement facility in the Chonnae area with an annual capacity of 5.0 million tons was scheduled for completion in 1976. Expansion of the Haeju cement works on the west coast to 3.0 million tons per year was nearing completion with the installation of large kilns. A small cement works with an annual capacity of 200,000 tons was being constructed in Changang Province. When completed, the cumulative capacity of the expanded works and new plants would exceed the 1976 production level target of 8.0 million tons.

Fertilizer Materials.—Production of chemical fertilizers in 1975 was probably around 2.5 million tons, of which nearly one-half was produced by the Hungnam fertilizer complex, and most of the remainder by the Chongsu chemical plant and the Suchon nitrolime fertilizer factory. Medium and small-scale phosphate fertilizer plants were located in almost all of the provinces. Construction continued on the Youth chemical plant in the western region, which included a 360,000-ton-per-year unit to produce urea. Status on the construction of the urea plant Ch'ongnyon was not reported.

Magnesite.—North Korea continued to be the world's largest producer of magnesite. Mine output in 1975 was estimated at 1.7 million tons, all from the Yongyang area of South Hamgyŏng Province. Crude magnesite was beneficiated and sintered at plants in Tanch'on, Songjin, and Ch'ongjin. Production of magnesium oxide clinker was around 1.1 million tons. The Korea Equipment Import Corp. ordered a 200,000-ton-per-year magnesite beneficiation and sintering plant from a West German-Austrian consortium composed of Klockner-Humboldt-Deutz Industrie-Analagen, A.G. (Cologne), Krauss-Maffei A.G. (Munich), and Siemens-Osterreich and Waagner-Biro A.G. (both of Vienna), The plant, which will be sited at Ch'ongjin, was scheduled for delivery to meet a planned 1977 startup deadline. Estimated cost of the entire plant purchase was $51 million.

Other Nonmetals.—North Korea continued to be one of the world's largest producers of graphite. Output in 1975, estimated around 75,000 tons, was mostly low-grade amorphous material. Production of other significant nonmetallic minerals were estimated as follows, in tons: Barite, 120,000; fluorspar, 30,000, and talc-group minerals, 130,000.

MINERAL FUELS

Coal.—North Korea's major mineral is coal with output in 1975 estimated at about 40.0 million tons, approaching the target set in the 6-year plan. The Chollima Sinchang coal mine, the Nation's largest producer, and other large collieries at Anju, Aoji, Choyang, and Kowon, were expanded and worked with modern mining equipment. Coal deposits in Kangdong, Kangso, and Tokchon were recently developed, and two new mines at Kukdong and Yangjong in North Hamgyŏng Province were reportedly opened in 1975. Production from other existing mines included Chiktong, Chonsong, Huknyŏng, Kaechon, Komdok, Musan, Taedaeri, Toksong, Yongdae, and Yongnun.

During 1975, a 10-kilometer cableway to transport coal was installed between the Kangso colliery and the Kangsŏn iron and steel complex near P'yŏngyang. Belt conveyors, to load the coal into conveyor buckets and to unload coal at storage terminals, were fully automated. Use of the cableway reportedly increased the transport of coal 2.5 times over that of the operation which formerly required 50 heavy-duty trucks. The second stage of the project to triple the coal transport capacity was being planned.

In addition, a second cable transport project was reported to have been completed between the Taedaeri mine and the Nampo industrial complex. The announcement regarding this installation was vague and only added that the cableway extended "scores of ri" (a "ri" is equivalent to 2.44 miles).

Petroleum.—There are no known occurrences of oil in North Korea, and domestic demand for petroleum has been met through imports, principally from the People's Republic of China and the U.S.S.R. Late in the year, a pipeline to transport crude oil from the Taching oilfield in China, northwest of Harbin, to North Korea was completed. This source would provide the country with an estimated 1.5 million to 2.0 million tons of oil per year. A refinery and petrochemical complex was reportedly being built in the western part of the country. However, no information was available regarding the status of this project.

The Mineral Industry of the Republic of Korea

By E. Chin [1]

During the third 5-year economic development plan, the economy of the Republic of Korea was projected to grow at an average annual rate of 8.6% between 1972 and 1976. In current prices, the 1975 gross national product (GNP) was estimated at 9,052 billion won, or U.S. $18.7 billion.[2] By sectors, mining and manufacturing accounted for 29% of the GNP in 1975, compared with 26% for agriculture, forestry, and fishery, and 45% for trade, construction, transportation and other components of the national aggregate.

By value of mine output, the mining industry grew by 12% in current prices in 1975, compared with 6% in 1974.[3] During the year, production of anthracite increased by 15% over the mine output of 15.3 million tons in 1974. The principal mining sectors reporting increased outputs were fluorspar, graphite, iron ore, kaolin, clays, lead, sand and gravel, talc and related materials, and zinc. Producers of cement, fertilizers, petroleum products, iron and steel, and nonferrous smelter products also reported increased output.

Production indexes (1970 = 100) for the major components of the mining and mineral processing sector for the last 2 years follow:[4]

	1974	1975
Anthracite	123	142
Tungsten mining	141	138
Other metal mining	106	112
Nonmetal mining	150	166
Cement	153	174
Petroleum products	188	152
Industrial chemicals	152	199

Inflation continued upward in 1975; wholesale prices were generally 20% higher than in 1974. The wholesale price index (1970=100) for all commodities increased 26% to 238; in 1974 the increase was 42%. Wholesale price increases for selected commodity groups follow: Industrial chemicals, 28.6%; metals and metallic products, 3.3%; machinery, 16.2%; and fuels and electricity, 18.3%. Consumer prices increased about 25% in 1975, compared with 26% in 1974. The consumer price index in 1975 was 204 (1970=100), up 25% over that of 1974.

On August 29, 1975, a ground-breaking ceremony was held at Onsan for the Republic of Korea's first zinc refinery. The Koryo Zinc Co., a joint venture of Young Poong Mining Co., Ltd., and Toho Zinc Co. Ltd. of Japan, began construction of a zinc refinery with an annual capacity of 80,000 tons of metal to be completed by yearend 1977. The Tongyang Cement Manufacturing Co., Ltd. completed the expansion of its Samcheon facility. Additionally, the Asia Cement Manufacturing Co., Ltd. and the Hanil Cement Manufacturing Co., Ltd. were about 70% complete in their expansion program to increase the annual production capacity of cement.

During the year, a 35,000-ton, high-

[1] Physical scientist, International Data and Analysis.
[2] Where necessary, values have been converted from Koran won (W) to U.S. dollars at the rate of W484=US$1.00 for 1975.
[3] Mining Journal (London). Mining Annual Review, 1976: Republic of Korea. P. 393.
[4] Korea Annual 1976. V. 13, Hapdong News Agency, Seoul, Korea.

density polyethylene plant and a 5,000-ton polypropylene glycol plant were dedicated at the Ulsan petrochemical complex. Also, the construction of a 330,000-ton methanol plant was completed at Yosu, bringing the number of petrochemical plants to 15 in the Republic of Korea.

Progress continued on the expansion projects at the integrated steel facility at Pohang. The annual capacity to produce crude steel at Pohang was to be increased from 1.0 million tons to 2.6 million tons. The Hyundai Shipbuilding and Heavy Industries Co., Ltd. expanded the annual capacity of its shipyard at Ulsan from 0.8 million tons to 2.0 million tons, thereby bringing the Nation's total annual shipbuilding capacity to 2.4 million tons at yearend 1975.

Low-sulfur oil was reportedly discovered near Pohang City at a depth of 1,800 meters, and the Ministry of Commerce and Industry subsequently set up a special committee to coordinate further drilling in the area. Royal Dutch/Shell, Texas, and the Gulf Oil Co. were granted contracts by the Government for oil prospecting on the Continental Shelf.

In 1975, the Ministry of Commerce and Industry revised the Government's long-term energy supply-demand program, which was originally drafted in 1973. The annual rate of increase in the demand for energy in the Republic of Korea was reduced from 11.3% to 9% for 1977–81. Revised projections for energy demand in 1981 were as follows, in million tons: Charcoal, 6.0; coal, 30.8; oil products, 47.5; and output of hydropower and nuclear power in terms of coal, 6.0. During the plan period, the Government of Korea expects to spend 355.9 million won in the development of the coal industry, 287.9 million won for oil refining, and 2.4 million won for electrical generation. In addition to government spending, foreign exchange funds to be used for the overall energy program during the period were reportedly around $876.5 million.

PRODUCTION

In terms of value, the mining of anthracite dominated the mineral economy of the Republic of Korea. In 1975, 17.6 million tons of anthracite valued at $233 million was produced. Production of limestone was around 17 million tons and was used primarily in cement manufacture. Total output of portland cement during the year was 10.1 million tons. Mine production of zinc ore was 45,667 tons; about one-half was smelted domestically, and the remainder was exported. Production of tungsten ore was 2,403 tons and constituted about 6% of the world's output. Production of amorphous graphite decreased 56% to 44,893 tons. However, the Republic of Korea continued to be one of the world's leading producers of graphite.

Minerals and metals with increased production in 1975 were clays, copper, fluorspar, iron and steel, and lead. Little change in output for aluminum metal and pyrite was reported, while production of asbestos, bismuth, and feldspar declined.

Output from petroleum refining operations showed an increase over that during 1972–74. Production of residual fuel oil was up 6%, and production of distillate fuel oil up 13%. Jet fuel and kerosine production increased 5% and 60%, respectively, while that of gasoline decreased 5%.

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

Commodity	1973	1974	1975 p
METALS			
Aluminum metal, primary	16,600	17,671	18,000
Antimony, mine output, metal content	11	--	--
Arsenic, mine output, white arsenic equivalent	141	16	e 20
Bismuth, metal	99	131	113
Cerium, alloy	12	9	e 10
Copper:			
Mine output, metal content	956	1,294	1,541
Smelter	7,700	12,400	21,000
Metal, refined, including secondary	9,246	12,399	20,928

See footnotes at end of table.

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

Commodity	1973	1974	1975 p
METALS—Continued			
Gold metal [1] troy ounces	14,275	23,406	11,864
Iron and steel:			
Iron ore and concentrate, gross weight thousand tons	466	493	524
Pig iron do	455	987	1,186
Ferroalloys do	27	34	21
Crude steel (excluding castings) do	1,157	1,935	2,010
Lead:			
Mine output, metal content	11,827	10,047	9,927
Metal	r 4,640	4,606	5,739
Manganese ore and concentrate, gross weight	1,721	2,107	3,160
Molybdenum, mine output, metal content	r 71	88	82
Nickel, mine output, metal content	11	([2])	--
Rare-earth metals, monazite concentrate, gross weight	9	e 10	e 10
Silver, metal thousand troy ounces	1,490	1,307	1,494
Tin, mine output, metal content	8	10	4
Titanium, ore and concentrate, gross weight	165	160	e 160
Tungsten, mine output, metal content	2,043	2,289	2,403
Zinc:			
Mine output, metal content	48,319	42,266	45,667
Metal, primary	12,590	11,548	20,922
Zirconium concentrate, gross weight	23	40	e 40
NONMETALS			
Asbestos	5,707	5,710	5,345
Barite	204	745	2,602
Cement, hydraulic thousand tons	8,175	8,842	10,129
Clays, kaolin	208,537	271,812	298,264
Diatomaceous earth	3,982	11,688	19,285
Feldspar	28,460	24,617	20,138
Fertilizer materials, manufactured:			
Nitrogenous (urea) thousand tons	698	812	925
Phosphatic (magnesium phosphate) do	157	173	189
Mixed do	630	652	715
Fluorspar, metallurgical grade	22,156	16,261	16,935
Graphite:			
Crystalline	892	1,660	2,339
Amorphous	42,712	103,201	44,893
Kyanite and related materials, andalusite	83	115	106
Lime, slaked e	87,000	87,000	87,000
Mica, sericite	6,322	2,700	e 8,000
Pyrite, gross weight	1,261	1,635	1,664
Salt, marine thousand tons	742	574	665
Sodium compounds, sodium carbonate, manufactured	84,402	97,028	127,103
Stone, sand and gravel:			
Crushed and broken limestone thousand tons	12,903	14,572	16,904
Quartzite do	238	325	265
Sand (including glass sand) do	172	261	262
Sulfur, content of pyrite	378	491	e 500
Talc and related materials:			
Pyrophyllite	224,040	205,701	196,239
Talc	95,313	87,638	94,098
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	13,311	16,539	23,884
Coal, anthracite thousand tons	13,571	15,290	17,585
Coke	322,976	600,000	613,000
Fuel briquets, anthracite briquets e thousand tons	11,000	11,000	11,000
Peat do	4	e 4	e 4
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	6,529	4,416	4,173
Jet fuel do	3,661	4,038	4,251
Kerosine do	3,007	2,459	3,946
Distillate fuel oil do	17,952	18,411	20,816
Residual fuel oil do	56,698	58,868	62,380
Other do	10,900	12,574	19,407
Refinery fuel and losses do	8,573	8,655	2,742
Total do	107,320	109,421	117,715

e Estimate. p Preliminary. r Revised.
[1] Officially reported production only.
[2] Revised to none.

TRADE

Overall trade for the Republic of Korea in 1975 totaled about $12.4 billion; exports were $5.1 billion and imports $7.3 billion. Exports of minerals and related products during the year comprised about 8% of the value for all exports, while mineral imports were about 29% of all imports. The leading mineral export was iron and steel, which accounted for nearly three-fifths of the value of all mineral and metal exports. Iron and steel exports in 1975 were around 1 million tons, valued at $231 million.

The most important minerals imported in 1975 follow, with values in million dollars: Fuels, 1,387; iron and steel products, 345; iron ore, concentrates, and scrap metal, 127; and fertilizers, 53.

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

Commodity	1973	1974
METALS		
Aluminum:		
Bauxite and concentrate	700	--
Metal including alloys, all forms	r 5,754	6,948
Bismuth metal including alloys	2,082	67
Chromium:		
Ore and concentrate	--	17
Oxides and hydroxides	1	--
Cobalt metal including alloys, all forms	5	42
Copper:		
Ore and concentrate	(1)	--
Metal including alloys, all forms	r 405	1,088
Iron and steel:		
Ore and concentrate — thousand tons	261	76
Scrap — do	2	1
Pig iron, ferroalloys, and similar materials — do	14	12
Steel, primary forms — do	44	157
Semimanufactures:		
Bars, rods, angles, shapes, sections — do	54	154
Universals, plates, sheets — do	674	750
Hoop and strip — do	1	14
Rails and accessories — do	1	(1)
Wire — do	7	13
Tubes, pipes, fittings — do	100	206
Castings and forgings — do	22	37
Total — do	859	1,174
Lead:		
Ore and concentrate	15,979	7,638
Oxides	(1)	--
Metal including waste and sweepings	205	11
Molybdenum:		
Ore and concentrate	45	75
Trioxide	--	5
Metal	1	(1)
Nickel metal	1	12
Platinum-group metals and silver:		
Ores and concentrates	3,760	3,350
Metal including alloys — thousand troy ounces	176	14,219
Selenium	5	3
Tin:		
Ore and concentrate	5	33
Metal including alloys, all forms	23	8
Titanium oxide	190	30
Tungsten:		
Ore and concentrate	4,368	2,848
Metal including waste and scrap	1	1
Uranium and thorium metals including alloys, all forms — kilograms	5	4,990
Zinc:		
Ore and concentrate	59,260	54,474
Oxide	210	866
Metal including alloys, all forms	1	349
Other:		
Ores and concentrates of nonferrous metals, n.e.s	805	6
Ash and residue containing nonferrous metals	89	131
Base metals including alloys, all forms	r 109	84

See footnotes at end of table.

Table 2.—Republic of Korea: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum	1,068	43
Dust and powder of precious and semiprecious stones ___ kilograms	5	--
Grinding and polishing wheels and stones	87	22
Asbestos	16,623	301
Barite	346	--
Cement and clinker ___ thousand tons	1,531	1,950
Chalk	--	1,250
Clays and clay products:		
Crude clays, n.e.s.:		
Kaolin	212,258	164,092
Other	34,911	32,674
Products:		
Refractory	765	360
Nonrefractory	48,359	60,189
Diamond:		
Gem, not set or strung ___ thousand carats	50	55,565
Industrial ___ do	17,190	335
Diatomaceous earth	129	82
Feldspar, fluorspar, and related materials:		
Feldspar	7,830	10,350
Fluorspar	24,239	9,776
Other	25,796	1,841
Fertilizer materials:		
Crude	--	265
Manufactured:		
Nitrogenous	28,050	--
Other including mixed	24,625	--
Ammonia	--	10
Graphite, natural	44,935	69,959
Gypsum and plasters	363,751	253,570
Lime	13	--
Mica, all forms	3,228	3,585
Pigments, mineral, processed iron oxides	578	503
Precious and semiprecious stones, except diamond including synthetic ___ kilograms	1,218	114,742
Salt	241	475
Sodium and potassium compounds, n.e.s	r 421	2,068
Stone, sand and gravel:		
Dimension stone	r 80,716	106,321
Dolomite, chiefly refractory grade	19,400	24,150
Gravel and crushed stone	9,284	9,375
Limestone	13	161
Quartz and quartzite	137,503	221,214
Sand excluding metal bearing	10,513	13,209
Talc, crude and ground (including natural steatite)	65,015	49,691
Other nonmetals, n.e.s.:		
Crude:		
Meerschaum, amber, jet	50	--
Other	141,722	203,851
Slag, dross and similar waste, not metal bearing	33,043	38,055
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	4,165	7,769
Oxides, hydroxides, and peroxides of strontium, barium, magnesium	--	250
MINERAL FUELS AND RELATED MATERIALS		
Coal, coke and peat	219,150	25,250
Petroleum:		
Crude ___ thousand 42-gallon barrels	32	39
Refinery products:		
Gasoline ___ do	1,799	1,627
Kerosine ___ do	456	598
Distillate fuel oil ___ do	1,151	1,195
Residual fuel oil ___ do	2,084	949
Lubricants ___ do	2	127
Other ___ do	2,557	2,850
Total ___ do	8,049	7,346
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	19,305	3,524

r Revised.
[1] Less than ½ unit.

Table 3.—Republic of Korea: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Bauxite and concentrate	300	510
Oxide and hydroxide:		
For use in manufacturing aluminum	28,895	34,379
Other	10,795	9,546
Metal including alloys, all forms	r 26,245	27,597
Arsenic:		
Trioxide, pentoxide, acid	273	42
Metal including alloys, all forms	(1)	--
Beryllium metal including alloys, all forms ---- kilograms	18	16
Chromium oxide and hydroxide	714	718
Cobalt:		
Oxide and hydroxide	18	5
Metal including alloys, all forms	1	8
Copper:		
Ore and concentrate	20,866	21,843
Matte	85	240
Metal including alloys, all forms	29,405	39,284
Iron and steel:		
Ore ---- thousand tons	468	1,395
Metal:		
Scrap ---- do	r 806	1,120
Pig iron, ferroalloys, similar materials ---- do	88	5
Steel, primary forms ---- do	1,377	1,090
Semimanufactures:		
Bars, rods, angles, shapes, sections ---- do	128	198
Universals, plates, sheets ---- do	294	304
Hoop and strip ---- do	37	87
Rails and accessories ---- do	38	43
Wire ---- do	4	7
Tubes, pipes, fittings ---- do	57	28
Castings and forgings, rough ---- do	1	(1)
Total ---- do	559	667
Lead:		
Ore and concentrate	1,410	1,138
Oxides	6	153
Metal including alloys, all forms	13,013	13,916
Magnesium metal including alloys, all forms	119	288
Manganese:		
Ore and concentrate	30,345	56,168
Oxide and hydroxide	745	718
Mercury ---- 76-pound flasks	839	909
Molybdenum metal including alloys, all forms	6	6
Nickel:		
Matte, speiss, and similar materials	40	50
Oxide and hydroxide	(1)	(1)
Metal including alloys, all forms	1,137	2,001
Phosphorus, elemental	33	65
Platinum-group metals and alloys ---- troy ounces	2,170	17,201
Rare-earth metals including alloys	6	3
Selenium, elemental	1	1
Silicon, elemental	139	92
Silver ---- thousand troy ounces	207	1,900
Tantalum metal, all forms	3	3
Tin:		
Ore and concentrate	4,965	12,594
Oxides	(1)	(1)
Metal including alloys, all forms	1,615	715
Titanium:		
Ore and concentrate:		
Rutile	1,029	1,456
Ilmenite	13,956	18,469
Oxides	578	2,204
Tungsten metal including alloys, all forms	19	15
Uranium and thorium metals including alloys, all forms ---- kilograms	1	15
Vanadium pentoxide ---- do	253	271
Zinc:		
Ore and concentrate	3,140	2,074
Oxide	291	397
Metal including alloys, all forms	23,755	21,356
Zirconium ore and concentrate	652	477
Other:		
Ore and concentrate of base metals, n.e.s	59	77
Ash and residue containing nonferrous metal	5,576	520
Metals including alloys:		
Metalloids	3	1
Pyrophoric alloys	2	1
Base metals including alloys, all forms, n.e.s	39	53

See footnotes at end of table.

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

Commodity	1973	1974
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	891	962
Dust and powder of precious and semiprecious stones, including diamond ... kilograms	270	4,077
Grinding and polishing wheels and stones	172	276
Asbestos	96,229	64,847
Barite	91	--
Boron materials:		
Crude natural borates	(1)	55
Oxide and acid	483	497
Bromine	(1)	(1)
Cement, hydraulic	411	57,946
Chalk	8	--
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	11,091	16,527
Products:		
Refractory (including nonclay bricks)	28,198	343,883
Nonrefractory	109	980
Cryolite	--	3
Diamond, gem and industrial ... thousand carats	21,150	14,450
Diatomite and other infusorial earth	288	148
Fertilizer materials:		
Crude, phosphatic	530,587	562,270
Manufactured:		
Nitrogenous	9,552	8,473
Phosphatic	48,843	130,683
Potassic	179,983	206,191
Other including mixed	18,425	53
Ammonia	31,090	1,800
Fluorine, elemental	(1)	1
Graphite, natural	15	25
Gypsum and plasters	577	1,737
Iodine	8	4
Lime	22	5
Magnesite, crude, calcined, magnesia clinker	80	40
Mica, all forms	131	207
Pigments, mineral processed iron oxides	62	45
Precious and semiprecious stones, except diamond, including synthetic ... kilograms	618	19,992
Pyrite, unroasted	4,124	7,503
Salt	267,912	261,315
Sodium and potassium compounds, n.e.s	r 24,849	25,931
Stone, sand and gravel:		
Dimension stone, crude and partly worked	31	263
Dolomite, chiefly refractory grade	103	242
Gravel and crushed rock	18	93
Limestone	105,032	69,310
Quartz and quartzite	173	75
Sand, excluding metal bearing	877	11,726
Sulfur:		
Elemental	167,968	213,688
Sulfur dioxide	3	5
Sulfuric acid	55	50
Talc, steatite, soapstone, pyrophyllite	18	18
Other nonmetals, n.e.s.:		
Crude	843	2,395
Slag, dross and similar waste, not metal bearing	901	522
Oxides, hydroxides and peroxides of magnesium, strontium, barium	384	231
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	1,135	121
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	13	34
Carbon black and gas carbon	2,233	3,225
Coal, all grades, including briquets	611,713	773,415
Coke and semicoke	37,468	65,362
Gases, rare	127	112
Helium	27	17
Petroleum:		
Crude and partly refined ... thousand 42-gallon barrels	113,269	104,223
Refinery products:		
Gasoline ... do	18	12
Kerosine ... do	1,907	13
Distillate fuel oil ... do	--	27
Residual fuel oil ... do	551	2,124
Lubricants ... do	461	210
Other ... do	522	452
Total ... do	3,459	2,838
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	28,560	20,887

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—Production of aluminum metal by Aluminium of Korea, Ltd. (Koralu) at Ulsan remained at the 1974 level. Koralu, a joint venture of the Korean Industrial Bank and Péchiney Ugine Kuhlmann, uses alumina imported from Japan and electrical energy supplied by Korea Electric Co., Ltd. Feasibility studies to expand smelter capacity fourfold to 72,000 tons per year by 1979 were underway. Additionally, the Government was considering plans to establish a smelter at Onsan, capable of producing 100,000 tons of ingot per year, as part of the programs to be included in the fourth 5-year economic development plan (1977–81).

Copper.—The Kumpuk copper mine at Kyunsang Namdo accounted for the bulk of the Nation's copper output in 1975. About 15,000 tons of electrolytic copper was produced by the Chanhang copper smelter owned by Korea Mining & Smelting Co., Ltd. In 1975, Noranda Inc., and Furukawa Denki withdrew their participation in the plans for constructing a 100,000-ton-per-year copper refinery at Onsan. Reportedly, Sybetra SA (Belgium), Davy Powergas, Ltd. (U.K.), and Outokumpu Oy (Finland) have expressed interest in participating in the proposed copper smelter-electrolytic refinery facility, which would be part of the nonferrous metals industrial complex being developed at Onsan.

Iron and Steel.—The Yangyang iron mine and the Pochon mine accounted for the bulk of the country's output of iron ore. Production amounted to about 524,000 tons in 1975, compared with 493,000 tons in 1974. Pig iron production, all by the Pohang Iron and Steel Co., Ltd. (Pohang), was 1.2 million tons. Plans were being considered to double the output capacity of pig iron to 2.6 million tons at Pohang. About 70% of Pohang's iron ore requirements is met by imports. Moreover, 100% of Pohang's coking coal requirements is supplied from imports. Total steel ingot production in 1975 was around 2.0 million tons.

Lead.—Young Poong Mining, which operated the Yeonhua, Boonpyong, and Ulgin mines, accounts for virtually all of the country's lead mine output. The lead content of the ore ranges between 3% and 10%, and there is a high silver concentration. During the year, about 24,000 tons of concentrate, grading 50% lead, was produced. Output of pig lead was about 6,000 tons, all by the Korea Mining and Smelting Co. Young Poong Mining was planning a 50,000-ton-per-year smelter, to be built at Onsan by 1980. Capitalization was estimated at $12.5 million.

Tungsten.—The Sangdong mine of the Korea Tungsten Mining Co. Ltd., produced most of the country's tungsten output. Total production of scheelite tungsten concentrate, averaging 70% WO_3, was 4,403 tons. The Nation's production of tungsten constitutes about 6% of the total world's output. About 600 tons of ammonium paratungstate and 350 tons of tungsten powder and carbide were produced in 1975. Production of tungsten metal was not reported.

Zinc.—The three mines of the Young Poong Mining Co. account for the Nation's total production of zinc. Output from the Yeonhua mines account for about 78% of the zinc mined in 1975.

On August 29, 1975, a ground-breaking ceremony was held at Onsan for the construction of a 80,000-ton-per-year zinc refinery. The zinc refinery, a joint venture project between Young Poong Mining and Toho Zinc Co., Ltd., will also produce 150,000 tons of sulfuric acid and 432 tons of cadmium as byproducts annually. Estimated cost of the project was $71.3 million, of which $39.0 million would be provided by foreign capital and the remainder by domestic funds.

Other Metals.—A little over 100 tons of bismuth metal was recovered as a valued byproduct of tungsten mining and processing at Sandong. Silver, recovered from copper and lead operations, totaled close to 47 tons. Production of manganese ore of 35% grade totaled 3,160 tons, while that of gold was 11,864 troy ounces.

NONMETALS

Cement.—Cement production by nine plants of seven companies totaled 10.1 million tons. During 1975, the Tongyang Cement Manufacturing Co., Ltd., expanded the production capacity of its Samcheong plant by 1.6 million tons per year to 2.6 million tons per year. The expansion programs at the Asia Cement

Manufacturing Co., Ltd., and the Hanil Cement Manufacturing Co., Ltd., were reportedly 69% completed at yearend. Total cement manufacturing capacity was 11.9 million tons at yearend 1975, distributed as follows, in thousand tons:[5]

Asia, Jecheon	785
Hanil, Danyang	1,385
Hyundai, Danyang	400
Korea:	
Jangseng	660
Mun-gyeong	480
Ssangyong:	
Donghai	2,900
Yeongweol	1,700
Sungsin, Danyang	1,000
Tongyang, Samcheong	2,550

Five cement manufacturers plan to raise their production capacity by an additional 9.1 million tons. Upon completion of these plans in 1977, the Nation's cement production capacity will be around 21 million tons annually, of which about one-third will be made available for export.

Fertilizer Materials.—Chinhae Chemical Co., Ltd., Hankook Fertilizer Co., Ltd., Yong Nam Chemical Co., Ltd., and Korea General Corporation were the Nation's producers of urea, with a total combined capacity of 968,000 tons per year. Compound fertilizers were produced by Chinhae Chemical Co., Ltd., and Yong Nam Chemical with a combined annual capacity of 361,000 tons. Kyunki Chemical Co., Ltd., and Pungnong Chemical Co., Ltd. produced fused phosphate fertilizers and calcium cyanamide. Ammonium sulfate was produced by the Hankook Caprolactam Corp., and as a byproduct by the Pohang Iron & Steel Co., Ltd.

Namhai Chemical Co., a subsidiary of the Korea General Chemical Corp., plans to construct a large-scale compound fertilizer plant in Yeocheon, Jeonnam Province. This facility is to have an annual production capacity of 700,000 tons of urea and 330,000 tons of compound fertilizer. Additionally, the plant is to produce sulfuric acid, phosphoric acid, nitric acid, and ammonium nitrate. The plant was scheduled for completion in 1977.

Other Nonmetals.—Limestone production totaled close to 17 million tons and was used principally in the manufacture of cement. Production of other nonmetallic minerals during 1975 follows, in tons: Marine salt, 665,000; kaolin, 298,000; talc and related minerals, 290,337; quartzite, 265,000; and silica sands, 262,000. Production of graphite was 47,233 tons, of which 95% of the total was the amorphous type. Production of feldspar and fluorspar was 20,138 and 16,935 tons, respectively.

MINERAL FUELS

Coal.—*Anthracite.*—Output of anthracite in 1975 was 17.6 million tons, valued at $233 million. Virtually all of the production was domestically consumed, primarily for space heating. The recoverable reserves of coal in the Republic of Korea were estimated in 1974 at 545 million tons, of which 58% are located in the Samchong and Chungnam coalfields. Other major coalfields are Danyang, Gangreung, Heongseon, Mun-gyeong, and Pyeongchang.

The Government-owned Dae Han Coal Corp. produces about one-third of the country's anthracite output. Dae Han's largest mine is Chang Song, which is 600 meters deep. The leading private company is San Chang Coal Co., Ltd., which operates the Samchuk mine. A number of private companies produce the remainder of the country's output of anthracite.

The Ministry of Commerce and Industry estimated that the domestic demand for coal would reach 31 million tons by 1981. Under the long-term energy supply-demand program, 355.9 million won, in addition to $152.3 million in foreign exchange funds, will be invested in the development of the coal industry. The Government's basic policy was to complete geological surveys of all coalfields to locate deep seams and to mine hitherto undeveloped coal seams.

Petroleum.—The Republic of Korea imports all of its oil requirements, mostly in the form of crude petroleum. In 1975, approximately 15.3 million tons of crude oil was imported, valued at $1.3 billion. In 1975, the domestic demand for oil products was estimated at close to 110 million barrels. Consumption by product type follows, in million barrels: Gasoline, 4.6; kerosine, 3.6; light oil, 19.8; heavy oil, 3.1; bunker oil, 58.1; jet fuel, 4.1; naphtha, 10.7; solvents, 0.6; propane gas, 0.7; and asphalt, 1.4.

Three oil refineries with a daily refinery capacity of 215,000 barrels were operated by the Korea Oil Corporation, the Honam Oil Refinery, and the Kyung In Energy

[5] Korea's Economy Past and Present. May 1975.

Co., Ltd. Kyung In Energy plans to expand its daily oil refining capacity by 60,000 barrels by 1977. A new oil refinery, with a daily refining capacity of 60,000 barrels scheduled for 1978, is to be built by the Ssangyong Business Group at Onsan.

Late in 1975, an oil find was made on the southern coast near Pohang. Oil was extracted from one of three exploratory[6] holes drilled to 1,500 meters as part of a wildcat program by the National Institute for Science and Technology. Confirmation drilling will be done by foreign experts. Earlier in the year, Shell reported oil and gas deposits at 2,800 meters below seabed at 80 kilometers east of Cheju Island. However, commercial prospects for development were not considered high.

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[6] Korean Business Review. No. 43, March 1976, Korea Strikes Oil Prospects. p. 36.

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. During 1975, three oil companies worked concessions in the partitioned 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

Kuwait's gross national product (GNP) reached $10.7 billion[2] in fiscal year 1975, an increase of 64% over that of 1974. The petroleum and natural gas industries were the most important contributors to that noteworthy gain, despite dwindling production and sales, and the country continued to enjoy a favorable balance of trade. Several billion dollars will be invested in industrial and transportation projects during the next 5 years in Kuwait, and large investments will be made outside the country.[3] Important investment ventures were negotiated during 1975 with Brazilian, Japanese, and Mauritanian companies. Kuwait signed an agreement with Brazil forming the Arab-Brazilian Investment Co. with an initial capital of $40 million. The new firm will direct its investments mainly to petroleum and other mineral industries in Brazil. A Kuwaiti-Japanese firm, the International Marine Construction Co., was organized in Kuwait to conduct engineering and construction work related to the petroleum industry in the Middle East. Marine Contracting and Services Co. of Kuwait owned 51% of the new venture, and the remaining interests were held by five Japanese companies including the Nippon Steel Corp. Kuwait and Mauritania established the jointly-owned Arab Co. for Mining and Industry that will produce iron ore in Mauritania. Early in 1975, the Kuwaiti Government also announced that it would

[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 KD1.00=US$3.45.

[3] U.S. Department of State. Foreign Economic Trends and Their Implications for the United States, 76–057, Kuwait, May 1976, pp. 1–8.

extend financial assistance to Yugoslavia. The Kuwaiti loan, valued at $125 million, will help finance the construction of a 283-kilometer crude oil pipeline from the Adriatic coast to refineries in Yugoslavia, Hungary, and Czechoslovakia.

In 1975, the Government took over the Kuwait Oil Co., Ltd. (KOC), and planned to further develop the country's oilfields, petroleum processing, and marketing facilities. During the year, Kuwait also reached a tentative agreement with Saudi Arabia for the settlement of a long-standing dispute regarding the demarcation of the northern offshore boundary between Kuwait and the partitioned Neutral Zone.

Kuwait's oil revenues rose to $8.2 billion during fiscal year 1974–75, an increase of more than 300% from the 1973–74 oil revenues, according to the 1974–75 Annual Report of the Kuwait Central Bank.[4] This significant increase in revenues resulted from higher oil prices instituted by the Organization of Petroleum Exporting Countries (OPEC) late in 1973. The State budget for fiscal year 1975–76 was approved by the National Assembly in July 1975. Revenues from the petroleum industry (income taxes, royalties, and crude oil sales) were set at $5.8 billion for fiscal year 1975–76, or 97% of the total revenue.

The Kuwait Petrochemical Industries Co. (KPIC) developed plans to establish plants, probably at Shuaiba, to produce aromatic hydrocarbons and ethylene. KPIC will probably build the facilities in partnership with several foreign companies, and the projects may be operational by 1980.[5]

PRODUCTION

In 1975, Kuwait was one of the world's largest oil producers, and it was the fourth largest in the Middle East. More than four-fifths of the oil production came from KOC's fields in Kuwait proper, and the remainder was produced by Aminoil and AOC from fields in the partitioned Neutral Zone. About two-thirds of Kuwait's share of oil production from the Neutral Zone came from AOC's offshore wells.

Kuwait's oil production capacity exceeded the rate of 4 million barrels per day in 1975. However, total oil output averaged only 2.1 million barrels per day during the first 8 months of the year, increased to 2.7 million barrels per day in September, and then dropped to the yearly low of 1.7 million barrels per day in December. For 1975, oil production for Kuwait including its share of the output from the partitioned Neutral Zone averaged 2.1 million barrels per day, down 0.5 million barrels per day from 1974. The country's oil output has fallen steadily since its peak of 1,201 million barrels (averaging 3.3 million barrels per day) recorded in 1972. Kuwait's diminishing rate of oil output reflected reduced world demand and the Kuwaiti Government's policy of maintaining its oil prices and controlling the rate of production.

AOC's production came from two fields offshore the partitioned Neutral Zone. During 1975, the output from the Hout Field averaged 41,350 barrels of oil per day and the production from the Khafji Field averaged 263,650 barrels of oil per day. The company planned to increase its production from the two fields in 1976 to average 51,550 barrels per day from the Hout Field and 333,390 barrels per day from the Khafji Field.

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[4] Middle East Economic Survey (Beirut, Lebanon). Oil Revenues Rise to $8 Billion in 1974–75. V. 19, No. 18, Feb. 20, 1976, pp. 9–10.

[5] Middle East Economic Survey (Beirut, Lebanon). PIC Plans $700-Million Investment in Ethylene and Aromatics Plants. V. 19, No. 10, Dec. 26, 1975, p. 4.

Table 1.—Kuwait: Production of mineral commodities

Commodity	1973	1974	1975 p
NONMETALS			
Clay products, nonrefractory, sand-lime bricks ___cubic meters__	148,383	166,121	NA
Fertilizer materials, manufactured, nitrogenous:			
Ammonium sulfate ___metric tons__	118,795	126,286	NA
Urea ___do___	580,075	516,590	NA
Lime, hydrated and quicklime ___do___	401	513	e 550
Salt ___do___	10,030	12,626	e 15,000
Sodium and potassium compounds, caustic soda ___do___	4,361	6,549	NA
Sulfur ___do___	65,070	56,899	55,000
MINERAL FUELS AND RELATED MATERIALS			
Natural gas:			
Gross production [1] ___million cubic feet__	581,065	466,939	382,367
Marketed production [1] ___do___	186,045	188,264	183,792
Natural gas liquids:			
Natural gasoline e ___thousand 42-gallon barrels__	5,900	5,653	NA
Liquefied petroleum gas (propane and butane) e ___do___	16,300	16,240	NA
Total e ___do___	22,200	21,893	15,000
Petroleum:			
Crude [1] ___do___	1,102,465	929,342	761,633
Refinery products: [2]			
Motor gasoline ___do___	14,922	25,157	21,128
Jet fuel ___do___	855	1,406	7,992
Kerosine ___do___	7,787	8,540	1,057
Distillate fuel oil ___do___	27,196	23,998	23,659
Residual fuel oil ___do___	70,439	84,634	50,576
Other:			
Naphtha ___do___	12,698	4,904	4,383
Asphalt ___do___	328	1,610	408
Unspecified ___do___	4,535	--	14,153
Refinery fuel and losses ___do___	3,246	3,618	10,225
Total ___do___	142,006	153,867	133,581

e Estimate. p Preliminary. 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

Kuwait's trade in mineral commodities was dominated by the activities of the petroleum industry. The Government maintained basically a free trade policy, but prohibited exports to Israel, Rhodesia, and the Republic of South Africa. During the year, Kuwait severed its links with the U.S. dollar for trade purposes and tied the dinar to several foreign currencies, including the U.S. dollar.

In 1975, several major international trade agreements were negotiated. Kuwait agreed to furnish petroleum products to Abu Dhabi [6] and Japan, and negotiated crude oil sales contracts with Brazil, Japan, and Taiwan. Kuwait agreed to sell crude oil to Brazil at the rate of 60,000 barrels per day in 1975, rising to 120,000 barrels per day in 1976. Maruzen Oil Co., Ltd., of Japan contracted to buy Kuwaiti crude oil for a 3-year period beginning in 1975 at a rate of at least 10,000 barrels per day; Idemitsu Kosan Co., Ltd., also of Japan, signed an agreement to lift a minimum of 50,000 barrels per day of Kuwaiti crude oil for a period of 3 years also beginning in 1975. The agreement with Taiwan called for crude oil liftings by the Chinese Petroleum Corporation at rates of up to 40,000 barrels per day in 1976, reaching 50,000 barrels per day in 1977. The Royal Dutch/Shell Group signed an agreement to purchase 100,000 barrels per day of Kuwaiti crude oil in the first half of 1975, reaching 400,000 barrels per day in October 1975. Deliveries were to continue at that rate for an undisclosed period of time.

Shipments from the Aminoil terminal totaled 26.3 million barrels of crude oil and refined petroleum products (including bunkers) by 105 ships during 1975, compared with shipments of 29.8 million barrels of petroleum in 122 ships during 1974.

[6] Middle East Economic Survey (Beirut, Lebanon.) ADNOC Purchases Petroleum Products from KNPC. V. 18, No. 29, May 9, 1975, p. 9.

COMMODITY REVIEW

Natural Gas.—Contracts were awarded to several foreign firms for projects under the Government's Kuwait Gas Utilization Project, which was inaugurated in 1974. A large plant to process natural gas will be built near Shuaiba to produce more than 5 million tons per year of natural gas liquids. Four U.S. companies will supply turbine and compression units for the main plant,[7] which is to be built by Kellogg International Corp. of the United Kingdom.

Reserves of natural gas in Kuwait were estimated to total 37,778 billion cubic feet at yearend 1975, down 0.9% from the 38,139 billion cubic feet of reserves at yearend 1974. In the partitioned Neutral Zone, reserves of natural gas were estimated to total 19,749 billion cubic feet at yearend 1975 (including the Aminoil, AOC, and Getty fields), down 0.4% from the reserves of 19,838 billion cubic feet at yearend 1974.[8]

Petroleum.—BP (Kuwait) Ltd. and Gulf Kuwait Co. had shared the ownership of KOC, but relinquished the controlling 60% interest in the company to the Government in 1974. Lengthy negotiations were carried out during 1975 between the parties for the Government's takeover of the remaining shares in KOC, and agreements were finally reached in December. Under the terms of the agreements, the Government would become the sole owner of all KOC's assets, retroactive to March 5, 1975, including oilfields, pipelines, refinery, and export terminal facilities. Compensation was set at $50.5 million, and the two companies were given long-term crude oil supply contracts at discount prices. BP may lift Kuwaiti oil at an average rate of 450,000 barrels per day during the period January 1, 1976 to April 1, 1980, and Gulf may purchase Kuwaiti oil at an average rate of 500,000 barrels per day during the same period. Then, during the following 5 years, each will have the opportunity to purchase a further 400,000 barrels of oil per day. Sales will be at market prices, less a discount of 15 cents per barrel. BP and Gulf further agreed to provide technical services and personnel to Kuwait on commercial terms, and they are obliged to transport unspecified quantities of their liftings in Kuwaiti tankers and to purchase a certain proportion of their bunker fuels from Kuwait.[9] The Government did not take any action during the year to take over the operations of Aminoil and AOC in the partitioned Neutral Zone, but announced its intentions to take over the remaining private interests in the Kuwait National Petroleum Co. (KNPC), operator of the Shuaiba petroleum refinery.

The Government of Kuwait announced in 1975 that future Kuwaiti crude oil sales contracts would include provisions giving preference to transport by the Kuwait Oil Tanker Co. (KOTC) or the Arab Maritime Petroleum Transport Co. (AMPT). AMPT was established in November 1975 by Bahrain, Egypt, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

KOTC took delivery of the supertanker *Al-Andalus* during the year from a Spanish shipyard.

Kuwait was served by three petroleum refineries during 1975 with a combined daily throughput capacity of 612,000 barrels of oil: Mina al Ahmadi (KOC), Mina Abdullah (Aminoil), and Shuaiba (KNPC); and the 30,000-barrel-per-day AOC refinery operated at Ral al Khafji, in the partitioned Neutral Zone. The KOC and KNPC plants, representing more than 75% of the refining capacity in Kuwait proper and owned and operated by the Government, operated at only 37% capacity during 1975, when the throughput of the two averaged only 176,188 barrels of oil per day. Coincidentally, during the year KNPC raised the capacity of its Shuaiba plant to 180,000 barrels per day and awarded a $70 million contract to Foster Wheeler, a U.S. firm, to further increase the refinery's throughput capacity. KNPC will expand the hydrocracking facilities at the Shuaiba refinery. The project includes installing a 42,000-barrel-per-day isocracking processing unit and a hydrogen production facility by 1977.[10]

The Aminoil refinery processed 30.2 mil-

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[7] The Wall Street Journal. Four U.S. Companies to Build 7 Stations For Kuwait Gas Plant. V. 186, No. 110, June 9, 1975, p. 8.

[8] World Oil. Estimated Proved World Reserves of Crude Oil and Natural Gas, by Countries (Excluding Natural Gas Liquids). V. 183, No. 3, Aug. 15, 1976, p. 44.

[9] Middle East Economic Survey Supplement (Beirut, Lebanon). Kuwait Takes Over. V. 19, No. 7, Dec. 5, 1975, pp. 1–5.

[10] Oil Daily. Foster Wheeler Gets Kuwaiti Contract. No. 5,869, Apr. 11, 1975, p. 6.

lion barrels of crude oil during 1975 and produced 29.1 million barrels of petroleum products. In millions of barrels, the output was: Distillate blending stock, 2.7; fuel oil (high sulfur), 19.9; fuel oil (low sulfur), 2.4; and naphtha, 4.1.[11] During 1974 Aminoil processed 30.2 million barrels of crude oil, and output totaled 29.4 million barrels of petroleum products: Distillate blending stock, 2.2 million barrels; fuel oil (high sulfur), 17.2 million barrels; fuel oil (low sulfur), 5.4 million barrels; and naphtha, 4.6 million barrels. Two fires damaged the Aminoil refinery during the month of December. The first inflicted only minor damage to the plant, but an extensive fire on December 27 caused damages estimated to exceed $1.7 million to the refinery's desulfurization unit.

No wells were reported completed in Kuwait during the year, although a Spanish company was drilling one well under contract with KOC. That well was projected to be drilled to a depth of nearly 4,000 meters. KOC planned to begin drilling a 6,000-meter well in 1976, the deepest ever for Kuwait, hoping to discover hydrocarbons believed to underlie the Burgan oilfield.

Drilling declined in the partitioned Neutral Zone; 12 wells were completed in 1975 (10 oil and 2 service), compared with 20 drilled in 1974. AOC had three offshore rigs operating under contract during the year, and the drilling totaled 23,160 meters in 1975, 10,300 meters less than that of 1974. Onshore, Aminoil did not drill any wells during 1975, but planned to drill three exploratory wells in 1976.[12] The company carried out a marine seismic survey covering 570 kilometers in the offshore territorial waters of the partitioned Neutral Zone.

Aminoil crews performed well workovers during the year and brought the South Fuwaris, South Umm Gudair, and Wafra oilfields up to full production. The company installed nine new field pumping units in 1975, and planned to add 17 more during 1976.

Crude oil reserves for Kuwait were estimated at 70.2 billion barrels at yearend 1975, sufficient for 96 years of production at the average rate of 2 million barrels per day. The total crude oil reserves of the partitioned Neutral Zone were estimated at 6.6 billion barrels at yearend 1975, including reserves in offshore fields.

SAUDI ARABIA

Saudi Arabia maintained its position as the leading producer-exporter member of OPEC. Its estimated proved crude oil reserves were set at 107,857 million barrels at yearend 1975, an increase of 4,377 million barrels or 4.0% over that of yearend 1974.

The Ministry of Petroleum and Mineral Resources revealed plans to conduct a 5-year study of all minerals in the country. The study will locate and delineate all known mineral deposits, and it will report on the economic feasibility of exploitation of those minerals. The Saudis awarded a 4-year contract valued at $675,000[13] to a Canadian firm to recruit 12 geologists for the Government's program to gradually take over all mineral exploration in the country. Saudi Arabia also negotiated an agreement with Sudan for jointly exploring the Red Sea for minerals. The Government and British Petroleum Corp. (BP) began negotiations during the year concerning the establishment of a protein-from-oil project in Saudi Arabia using BP technology. A study group will investigate the feasibility of constructing and operating a protein plant rated at 100,000 tons per year, as well as a paraffin extraction plant and downstream facilities for turning the protein into animal feed. UOP Inc. of the United States will carry out a detailed feasibility study for the development of mineral resources in Saudi Arabia, according to an agreement signed by the company and the General Petroleum and Mineral Organization (Petromin).[14] Petromin also renewed a cooperative agreement for 2 years beginning in July 1975 with the French Bureau of Recherches Géologiques et Minières. The original agreement was signed in 1964.

Early in the year, Petromin announced a development program for the period

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[11] American Independent Oil Company. 1975 Annual Review of Operations. Pp. 1–24.
[12] World Oil. Divided Neutral Zone. V. 183, No. 3, Aug. 15, 1976, p. 177.
[13] Where necessary, values have been converted from Saudi Arabian riyals (SRls) to U.S. dollars at the rate of SRls3.5176=US$1.00.
[14] Oil Daily. UOP Process Unit to Head Saudi Study. No. 5,953, Aug. 11, 1975, p. 4.

1975–80 that involved investments totaling nearly $13 billion in a number of projects, including establishing aluminum and steel industries as well as petroleum industry developments.[15] About $5 billion will be spent developing natural gas gathering, transmission, and treatment projects; $3 billion developing petroleum refineries; $4 billion for petrochemical plants; and the remainder will be utilized on other industrial projects.

Saudi Arabia launched its second 5-year (1975–80) development plan that would see some $140 billion invested in the industrial, power, transportation, and other economic sectors. It reflected the Government's desire to achieve economic independence by extensive investment in nonpetroleum industrial projects. Water desalination plants will be constructed along the Persian Gulf and Red Sea coasts, and associated facilities will raise the country's electric power generating capacity 3,300 megawatts under the 5-year plan. Over the next 5 years, the Saudis will spend $7 billion to $8 billion on desalting and power-generating facilities at 25 sites. The highway network and seaports will be enlarged, the international airports at Juddah and Ar Riyad will be extended, and as many as nine new domestic airfields may be constructed. The Government will establish manpower training centers to enable large numbers of the nonskilled labor force to become productive in the industrial sector of the economy; however, the development projects will require the continuing services of a large number of skilled foreign workers.

Transportation projects approved during the year included constructing a new $46 million airport, developing port facilities on both coasts, and building several cross-country pipelines. The new airport will be built at Abha in the southwest part of the country. The Government also issued a $12.8 million contract to a Republic of Korea firm to build a petroleum storage and distribution center at Qīzan on the Red Sea; the depot was scheduled to be completed within 15 months. Contracts valued at $413 million were awarded to a group of Dutch companies to construct port facilities in the Persian Gulf to serve the projected industrial center at Al Jubayl.

The Saudi Arabian Saline Water Conversion Corp. awarded a $91 million contract to Sanderson and Porter, Inc., of the United States to be the consultants for the construction of an electric power generating and water desalination complex at Al Jubayl. The plant, possibly largest of its kind in the world, will produce up to 175 million gallons of fresh water per day and 1,750,000 kilowatts of electricity per day to serve nearby communities and industries. The Ministry of Agriculture and Water awarded a similar contract to the same U.S. firm to design and supervise the construction of a smaller complex, to be rated at 30 million gallons of fresh water per day and 300,000 kilowatts of electric power per day, and also slated to serve the Al Jubayl area. The Arabian American Oil Co. (Aramco) and the Government developed plans for a new integrated electric power system for eastern Saudi Arabia that would serve the oil company, other industries, and the inhabitants of the region.

The Government transferred the responsibility for petroleum, natural gas, and minerals projects from Petromin to the Ministry of Industry and Electricity. Petromin's responsibilities will be in refining, distribution, marketing, and transportation. The firm will also supervise the operations of the Arabian Drilling Co., Arabian Geophysical and Surveying Co., and the Arabian Marine Petroleum Construction Co.

During 1975, Saudi Arabia negotiated an agreement with Abu Dhabi to define the border between the two countries. Iraq and Saudi Arabia also signed an agreement providing for the partition of the Neutral Zone located between those two countries and to the west of Kuwait by dividing the zone into two equal areas that would be annexed into the respective States; and the two countries signed an agreement defining their 760-kilometer common border. During the year under review, Saudi Arabia also reached a tentative agreement with Kuwait that may settle a long-standing dispute regarding offshore boundaries.

The Saudis negotiated 5-year economic and technical cooperation agreements with several foreign countries during 1975. Italy negotiated such an agreement that called for a working group to identify specific joint projects. The Italians envisaged participation in a number of development projects in Saudi Arabia that included civil engineering, mining, petrochemicals, and

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[15] Arab Oil and Gas. Petromin's Board Approves a $12.7 Billion Development Program for 1975–80. V. 4, No. 81, Feb. 1, 1975, p. 17.

transportation. A Japanese-Saudi agreement provided for increased Japanese investments in Saudi Arabia in petrochemical projects and in providing vocational training for Saudi workers.

Kuwait and Saudi Arabia concluded a number of economic agreements, and agreed to study the feasibility of developing the use of atomic energy for the desalination of sea water and for the generation of electricity. The Saudis held preliminary talks with France concerning the possible construction of two nuclear reactors in the country.[16]

Saudi Arabia tied its currency to the Special Drawing Rights (SDR) and severed its currency links with the U.S. dollar. The exchange rates of the Saudi riyal and U.S. currency will be adjusted daily in relation to the SDR value. SDRs will be based on the values of 16 foreign currencies, including the U.S. dollar.

The petroleum industry dominated the Saudi economy, and government oil revenues soared to $25.7 billion in 1975 from an estimated $22.6 billion in 1974 and $4.3 billion in 1973.

PRODUCTION

Saudi Arabia was the most important oil producer in the Middle East and the third largest in the world during 1975. About 96% of the country's oil production came from Aramco's fields in Saudi Arabia, and the remaining 4% was the country's share of the oil produced in the partitioned Neutral Zone.

The output from Aramco's wells fluctuated from 5.6 million to 8.1 million barrels of oil per day in 1975, and reached its peak monthly rate of production during September. The company's oil output averaged 6.8 million barrels per day during the year, a decline of 16.8% from 1974. Aramco's declining output was in response to a worldwide slump in the demand for petroleum, and the company's rate of production during 1975 was only about 68% of the installed production capacity.

Processing and handling facilities were expanded at the Ra's at Tannūrah petroleum refinery, but the output of refined petroleum products fell 36 million barrels to 180.8 million barrels (averaging 495,300 barrels per day) during 1975. The throughput at the Ra's at Tannūrah plant averaged 376,934 barrels per day of crude oil and 137,163 barrels per day of natural gas liquids (NGL) during 1975, compared with 482,211 barrels per day of crude oil and 132,121 barrels per day of NGL during 1974.

[16] Middle East Money. Nuclear Reactors from France. V. 2, No. 12, Mar. 29, 1975, p. 6.

Table 2.—Saudi Arabia: Production of mineral commodities [1]

Commodity	1973	1974	1975 p
METALS			
Steel semimanufactures, hot rolled ---- metric tons	NA	e 14,000	e 14,000
NONMETALS			
Cement, hydraulic [2] ---- thousand metric tons	1,028	1,021	e 1,100
Gypsum [2] ---- do	e 45	17	e 17
Lime e ---- do	15	15	15
Sulfur e ---- do	5	5	18
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural:			
Gross production ---- million cubic feet	1,564,150	1,670,729	1,335,312
Marketed production e ---- do	160,000	219,000	200,000
Natural gas liquids:			
Propane and butane ---- thousand 42-gallon barrels	25,628	35,758	NA
Natural gasoline and other ---- do	9,822	11,638	NA
Total ---- do	35,450	47,396	e 50,000
Petroleum:			
Crude ---- do	r 2,772,590	3,095,641	2,582,550
Refinery products:			
Gasoline ---- do	[3] 44,900	43,813	8,420
Jet fuel ---- do	13,413	7,827	3,589
Kerosine ---- do	5,217	7,431	8,832
Distillate fuel oil ---- do	r 27,053	27,669	24,838
Residual fuel oil ---- do	r 107,805	98,787	78,724
Other:			
Liquefied petroleum gas ---- do	25,674	37,939	1,839
Naphtha ---- do	[4] 1,570	1,743	22,031
Asphalt ---- do	} 1,574	1,949	} 2,469
Unspecified ---- do		53	
Refinery fuel and loss ---- do	r 5,813	7,194	7,056
Total ---- do	r 233,019	234,405	157,798

e Estimate. 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 Neutral Zone, and Saudi Arabia's share of refinery output by its concessionaires in that area.
[2] Data presented are for the Hejra calender years which correspond closely to the Gregorian calender years.
[3] Naphtha apparently included in gasoline.
[4] Revised from none.

TRADE

State-owned Petromin marketed 149.2 million barrels of crude oil during 1975, compared with its direct sales of crude oil totaling 142.8 million barrels during 1974 and 88.2 million barrels during 1973. More than 90% of Saudi Arabia's petroleum output was exported. Aramco loaded 3,831 ships with a total of 2.4 million barrels of petroleum during the year, and more than 75% of the shipments were purchased by oil importers in Asia and Europe.

Table 3.—Saudi Arabia: Aramco ships loaded at gulf terminals

(Thousand barrels)

Year	Ships	Crude oil	Refined products
1973	4,131	2,263,183	203,049
1974	4,479	2,659,339	204,796
1975	3,831	2,281,396	166,183

Table 4.—Saudi Arabia: Aramco petroleum exports, by destination

(Percent)

Area	1973	1974	1975
Africa	3.4	1.4	1.7
Asia	29.2	30.4	33.0
Australia	.7	.7	.9
Europe	52.0	51.3	45.8
North America	5.2	4.9	4.3
South America	9.5	11.3	14.3
Total	100.0	100.0	100.0

Negotiations between France and Saudi Arabia included future trade relations between the two countries, and France reportedly discussed with the Saudis the possibility of building an export petroleum refinery in Saudi Arabia. Trade relations between Saudi Arabia and neighboring Jordan and Lebanon deteriorated during the year because of unresolved differences over pipeline deliveries of Saudi oil to those countries. A bilateral trade agreement between Lebanon and Saudi Arabia expired and was not renewed.

Petromin developed plans to market refined petroleum products in Europe beginning in 1976 at the rate of 100,000 barrels per day, and later to Japan and the United States.[17] During the year, the Saudis held talks with trade groups from the United Kingdom, and the two parties agreed to increase trade and to broaden economic and industrial cooperation.

Numerous tanker companies were formed in Saudi Arabia during 1975. The new firms were apparently established to take advantage of the Government's announced policy to give preference for oil exports to Saudi-owned tanker companies.

[17] Oil Daily. Saudis to Sell Refined Oil Directly to Europe by '76. No. 5,867, Apr. 9, 1975, p. 1.

Table 5.—Saudi Arabia: Exports of crude petroleum and petroleum refinery products [1]

(Thousand 40-gallon barrels)

Commodity	1973	1974	1975
Crude petroleum	2,560,342	2,897,924	2,314,945
Petroleum refinery products: [2]			
Shipments other than bunkers:			
Gasoline	38,435	36,680	32,551
Jet fuel	3,092	2,067	3,141
Kerosine	1,318	2,395	3,451
Distillate fuel oil	13,784	12,842	11,086
Residual fuel oil	35,108	18,388	26,410
Other	26,775	38,577	40,061
Total	118,512	110,949	116,700
Bunkers:			
Distillate fuel oil	1,000	1,279	1,262
Residual fuel oil	72,477	76,997	46,137
Total	73,477	78,276	47,399

[1] Includes Saudi Arabia's share of exports from the Kuwait-Saudi Arabia partitioned Neutral Zone.
[2] Excludes exports (if any) by Petromin.

Table 6.—Saudi Arabia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1974
METALS	
Aluminum:	
Oxide and hydroxide	3
Metal including alloys, all forms	5,437
Arsenic trioxide, pentoxide, acid	6
Copper metal including alloys, all forms	1,278
Iron and steel:	
Scrap	724
Pig iron, ferroalloys, and similar materials	5,842
Steel, primary forms [1]	13,060
Semimanufactures:	
Bars, rods, angles, shapes, sections	228,307
Plates and sheets	33,968
Hoop and strip	469
Rails and accessories	807
Wire	2,226
Tubes, pipes, fittings [2]	75,417
Castings and forgings	270
Lead:	
Oxides	33
Metal including alloys, all forms	516
Magnesium metal including alloys, all forms	38
Manganese oxides	26
Molybdenum metal including alloys, all forms	50
Nickel metal including alloys, all forms	189
Platinum-group metals and silver metal including alloys:	
Platinum group troy ounces	641,085
Silver do	27,039
Tin metal including alloys, all forms	284
Titanium oxides	245
Tungsten metal including alloys, all forms	9
Zinc:	
Oxides	196
Metal including alloys, all forms	421
Other:	
Ores and concentrates, n.e.s	69
Oxides, hydroxides and peroxides of metals, n.e.s	2
Metals including alloys, all forms:	
Alkali, alkaline earth, rare-earth metals	738
Pyrophoric alloys	30
NONMETALS	
Abrasives:	
Pumice, emery, natural corundum	478
Grinding and polishing wheels and stones	295
Asbestos	11,757
Barite and witherite	1,971
Boron materials:	
Crude natural borates	16
Oxide and acid	([3])
Cement	634,678
Chalk	1,622
Clays and clay products:	
Crude clays	16,745
Products, refractory and nonrefractory	4,340
Diatomite and other infusorial earth	3,138
Feldspar and fluorspar	([3])
Fertilizer materials:	
Crude:	
Nitrogenous	7,809
Phosphatic	239
Potassic	3
Other	354
Manufactured:	
Phosphatic	4,854
Potassic	262
Mixed	157
Ammonia	675
Graphite	1
Gypsum and plasters	366
Lime	26,648
Magnesite	82
Mica:	
Crude	103
Worked including agglomerated splittings	6
Pigments, mineral, including processed iron oxides	1,376
Pyrite, gross weight	598

See footnotes at end of table.

Table 6.—Saudi Arabia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1974
NONMETALS—Continued	
Salt and brine	2,766
Sodium and potassium compounds	2,705
Stone, sand and gravel:	
Dimension stone:	
Crude and partly worked:	
Calcareous	3,862
Slate	58
Other	1,428
Worked:	
Slate	265
Paving and flagstone	1,198
Other	2,910
Dolomite	51
Gravel and crushed rock	5,899
Sand, excluding metal bearing	298
Other	18
Sulfur:	
Elemental, all forms	1,067
Sulfur dioxide	91
Sulfuric acid	27
Other nonmetals, n.e.s.:	
Crude	25
Slag, dross and similar waste, not metal bearing:	
From iron and steel manufacture	144
Slag and ash, n.e.s	50
Oxides and hydroxides of magnesium, strontium, barium	42
Building materials of asphalt, asbestos and fiber cement, including unfired clay brick	6,655
MINERAL FUELS AND RELATED MATERIALS	
Asphalt and bitumen, natural	2,543
Carbon black and gas carbon	4
Coal and coke, including briquets	691
Hydrogen, helium and rare gases	91
Petroleum:	
Crude ... thousand 42-gallon barrels	12
Refinery products:	
Distillate fuel oil ... do	58
Lubricants ... do	271
Other ... do	65
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	1,642

[1] May include some unspecified semimanufactures.
[2] Includes blanks for pipes and tubes.
[3] Less than ½ unit.

COMMODITY REVIEW

Metals.— *Aluminum.*—Government planners reviewed plans for the construction of an aluminum smelter in Saudi Arabia that would produce up to 200,000 tons per year of aluminum ingots from imported alumina.

Iron Ore.—Although it had substantial deposits of ore with an iron content rated at between 32% and 50%, government studies have reported that enormous expense would be entailed in exploiting and transporting the ore from isolated areas in the country and recommended that Saudi Arabia import iron ore from abroad, namely Brazil.

Iron and Steel.—Petromin planned to expand the capacity of its steel rolling mill at Juddah from 45,000 tons per year to about 300,000 tons per year by 1978 or 1979. The pellets for the mill will be shipped from the projected joint venture steel plant to be built by Petromin and the Marcona Group at Al Jubayl, which will have a capacity to produce pellets at the rate of 3.5 million tons per year.[18]

Saudi Arabia will hold a 51% interest in a project with Sumitomo Metal Industries, Ltd., and Sumitomo Shoji Kaisha, Ltd., both of Japan, to build a plant at Ad Dammam in eastern Saudi Arabia to produce steel pipes at the initial rate of 20,000 tons per year, starting early in 1977.[19]

Nonmetals.— *Cement.*—Saudi Arabia had three cement plants in operation during 1975 with a combined output rated at 1.1 million tons per year. The Government contracted with a French firm to build a

[18] Middle East Economic Survey (Beirut, Lebanon). Petromin to Expand Juddah Steel Mill Capacity to 300,000 Tons by 1978–79. V. 18, No. 44, Aug. 22, 1975, p. 3.

[19] Metal Bulletin. Saudi Pipe Mill Progress. No. 5,994, May 30, 1975, p. 39.

new plant with a capacity of 2,000 tons per day in Buraydah,[20] near Ar Riyad. In addition to its domestic production, during 1975 Saudi Arabia scheduled imports of cement from Taiwan totaling 240,000 tons and from Japan totaling 500,000 tons. The Saudis also issued a contract to a Norwegian company to study plans for establishing a cement plant in the southern area of the country. The industry's future plans called for raising the country's cement production capacity to 10 million tons per year by adding five new plants and increasing the capacity of existing plants. The new facilities will be located at Al Jubayl, Al Hufūf, Tabūk, Yanbu', and in the Southern Province.

Fertilizer Materials.—Saudi Arabia and Taiwan negotiated an agreement during the year under which a fertilizer plant will be built in Saudi Arabia with Chinese assistance. The facility will produce up to 1,000 tons of liquid ammonia per day, sufficient for the production of up to 1,600 tons of urea per day.

Saudi Arabia reportedly agreed to extend an interest-free loan of $320 million to Syria to finance several projects, including the construction of an ammonia/urea complex at Homs, Syria, and the Saudi Government agreed to help Pakistan finance the construction of a fertilizer plant near Sukkur, Pakistan. Saudi Arabia will provide most of the foreign exchange financing required for purchasing the equipment for the $193 million Pakistani plant.

Other Minerals.—A $3.6 million plant will be constructed near Ad Dammam that will produce up to 8,400 tons per year of oil well drilling mud additives. The plant's capacity will be set at 2,400 tons per year of barite-base and 6,000 tons per year of bentonite-base additives.

Mineral Fuels.—*Natural Gas.*—The Government requested Aramco to plan, construct, and operate an extensive project to gather and process associated gas from the company's operations and to develop nonassociated gas production in the country. The total cost of the program may exceed $10 billion.[21] The project would be capable of processing up to 5.5 billion cubic feet of natural gas per day. Wet gas is to be treated at six plants in Saudi Arabia to remove sulfur and other contaminants. The processed dry gas then will be made available to industry. The Government project calls for the recovery of ethane (to be used as feedstock for petrochemical plants), hydrogen sulfide (to be converted into elemental sulfur), and NGL. The output of NGL from the project will be as much as 900,000 barrels per day. The NGL will include butanes, propanes, and natural gasoline. Pipelines will be built from the eastern producing areas to Yanbu', on the Red Sea, where the ethane and NGL will be processed. Aramco placed an order valued at $70 million with a U.S. company for 90 centrifugal compressors to be used in the gas development program, and Fluor Intercontinental Inc. will provide engineering and procurement services for the extensive gas project. During 1975 the Saudis also studied a proposal to pipe natural gas across the country to Yanbu', where it would be liquefied and loaded aboard tankers for export.

Another proposal under consideration was that of establishing a plant in Saudi Arabia to produce 2,500 tons per day of methanol for export to be used as chemical feedstock. Earlier, plans were considered to build a methanol fuel plant in the country to produce up to 12,500 tons per day to be exported.

In 1975 a natural gas treating plant was completed near Jaww al 'Uḍaylīyah to desulfurize gas used in gaslift water injection operations for the Ghawar oilfield.

Petroleum.—The U.S. shareholders in Aramco (Exxon Corp., Mobil Oil Corp., Standard Oil Co. of California, and Texaco, Inc.) conceded the principle of 100% takeover of their Saudi Arabian operations by the Saudi Government, and negotiations were held during the year concerning compensation for the transaction and the future role of the U.S. companies in Saudi Arabia. Mobil reached an agreement with the other U.S. shareholders in Aramco to increase the Mobil interest in Aramco from 10% to 15% over the next 5 years. The action will not affect the Saudi Government's interest in Aramco or its proposed takeover of the Saudi operation. Mobil's share in Aramco will increase 1% per year, reaching 15% in 1979, while the interest of the other U.S. shareholders will drop

[20] Middle East Economic Survey (Beirut, Lebanon). Saudi Arabia Initials Contract for $93 Million Cement Plant. V. 18, No. 29, May 9, 1975, p. 7.

[21] Middle East Economic Survey (Beirut, Lebanon). Cost of Saudi Arabia's Gas Project Escalates to $10 Billion. V. 19, No. 8, Dec. 12, 1975, pp. 1–4.

progressively to 28.3% each over the 5-year period. Aramco will remain a U.S. corporation wholly-owned by the four U.S. companies. The Saudi participation and proposed takeover affects only Aramco's operations in Saudi Arabia. Saudi Arabia and Kuwait reached an agreement during 1975 to cooperate in the takeover of the foreign oil company operations in the partitioned Neutral Zone.

In January 1975, the Saudi Arabian Government notified Getty Oil Co. that royalty rates and income taxes were being increased retroactively. Royalty rates were increased to 14.5% effective July 1, 1974, to 16.67% effective October 1, 1974, and to 20% effective November 1, 1974. Income tax rates were increased to 65.66% effective October 1, 1974, and to 85% effective November 1, 1974.

Concerned with the possible continuation of economic and political problems in transporting its crude oil through foreign countries to the Trans-Arabian Pipeline Co. (TAPline) export terminal on the Mediterranean Sea, Saudi Arabia studied plans to construct a pipeline from its oilfields to the Red Sea, bypassing Jordan, Lebanon, and Syria. One proposal called for rerouting the trunklines of TAPline to Red Sea and raising its overall capacity to 1 million barrels of oil per day; the alternate plan was for the construction of a 1,300-kilometer, 122-centimeter-diameter pipeline at a cost of about $1 billion from eastern Saudi Arabia to Yanbu' on the Red Sea. Future Saudi oil exports could then be switched from the Mediterranean and Persian Gulf outlet to the Red Sea. Owing to the sharply reduced demand for Mediterranean liftings and a dispute with Jordan and Lebanon over the prices of crude oil deliveries to refineries in those countries, TAPline's oil deliveries to Mediterranean consumers and export terminals dwindled during 1974 and were terminated by the pipeline company in February 1975. The Saudis resumed pumping oil to Jordan's Zerqa refinery and Lebanon's Zahrani refinery during the second quarter of 1975, following a request by the Saudi Arabian Government. During the latter part of the year, Lebanon made payments totaling $35 million to TAPline against outstanding debts for crude oil deliveries.

The Saudi Arabian Saline Water Conversion Corp. issued a contract to a United Kingdom firm to design and build a 45-kilometer petroleum products pipeline from the Juddah petroleum refinery to a seawater desalination and electric power generating plant nearby. The $6.7 million pipeline will utilize one pumping station at the refinery and will have a throughput capacity of 50,000 barrels of petroleum products per day.

A 100-kilometer pipeline was under construction from Buqayq to Ra's at Tannūrah that will transport NGL to the company's refining and export terminal on the coast. Additional storage and processing units will be added at Ra's at Tannūrah to handle the NGL. The company also added a second crude oil pipeline from the Al Qaṭīf pipeline junction to the Ju'aymah export terminal. Plans were reportedly approved during the year to build a 1,330-kilometer pipeline across Saudi Arabia to transport NGL to Yanbu' for petrochemical feedstock and for export.

Petromin reviewed plans to build four large export petroleum refineries, each with an initial capacity of 250,000 barrels of oil per day and capable of being expanded to 500,000 barrels per day; or three export plants with a combined capacity of 750,000 barrels per day and rising ultimately to 1.5 million barrels per day.[22] Negotiations continued during the year between Petromin and the Mobil Oil Corp. for construction of one of the 250,000-barrel-per-day facilities. The Mobil-Petromin petroleum refinery and petrochemical plant will be built at Yanbu' on the Red Sea, and the plant will be supplied with crude oil from the eastern oilfields by an 1,300-kilometer pipeline. The refinery-petrochemical complex will be jointly owned by Mobil and Petromin, and the Government will be the sole owner of the long-distance crude oil supply line.[23] Output from the Yanbu' refinery will be marketed chiefly in the United States and Western Europe.

Petromin also approved a project to construct a large petroleum refinery and petrochemical plant at Al Jubayl in eastern Saudi Arabia, in collaboration with the Royal Dutch/Shell Group. The plant will cost $1.2 billion to construct and will begin production in 1980 with an initial throughput capacity of 250,000 barrels of

[22] Middle East Economic Survey (Beirut, Lebanon). Saudi Arabia Petromin Embarks on $13-Billion Development Plan. V. 18, No. 30, May 16, 1975, pp. 1–3.

[23] Wall Street Journal. Mobil Says Saudis Clear Building of Big Refinery. V. 186, No. 40, Aug. 26, 1975, p. 2.

oil per day. The petrochemical complex will use NGL feedstocks and will produce a wide range of ethylene-based chemicals. A substantial proportion of the output will be exported. Petromin also signed a letter of intent with the Gulf Oil Corp. for the construction of a jointly-owned, $1.5 billion petroleum refinery and petrochemical complex. The project called for the refinery to initially process 250,000 barrels of crude oil per day; the petrochemical plant would produce 330,000 tons per year of ethylene-based chemicals. However, late in the year, Gulf and Petromin reevaluated and cancelled the project.

Petromin's small Ar Riyad petroleum refinery completed its first year of operation, and the company added an atmospheric vacuum distillation unit rated at 32,925 barrels of oil per stream day at the Juddah refinery. Aramco awarded a $50 million contract to the Fluor Corp. to design and construct a 25,000-barrel-per-day fixed bed naphtha reformer at the Ra's at Tannūrah petroleum refinery. The project was scheduled for completion during 1977.

Petromin finalized an agreement with Mobil for a $100 million lubricating oil production project under which the Government will hold 70% of the investment and Mobil, the remaining 30%. To be built at Juddah, the plant will have an annual capacity of 1 million barrels of lubricating oil base stocks. Part of the output will be processed by the Petrolube plant at Juddah.

The Dow Chemical Co. received Petromin's approval in principle for a project to build an $800 million petrochemical complex at Al Jubayl. The Dow plant would use associated natural gas as feedstock, and the initial plans called for the complex to include an ethane cracker, ethylene glycol unit, and a low-density polyethylene plant. Several other petrochemical projects were also under consideration in Saudi Arabia during 1975, including ammonia, methanol, and urea plants.

A major expansion project was carried out at the Ju'aymah deepwater tanker terminal, north of Ra's at Tannūrah, increasing the loading capacity there to 2 million barrels of oil per day. A third single-buoy mooring and tanks raising the crude oil storage capacity to 16.5 million barrels were also completed at the Ju'aymah terminal. A 900,000-barrel-capacity, 88-meter-diameter storage tank for propane was under construction at Ra's at Tannūrah and scheduled for completion during 1976. Two more tanks of the same size, one for butane and one for propane, will be built nearby during 1976 and 1977.

Seismograph crews were active in the central and eastern regions of the country, and an active program of exploratory drilling was carried out. Three new oilfields were discovered in 1975. Two of them (Lawhah and Ribyan) were found in the Persian Gulf and the third (Ad Dibdibah) in the northwest corner of Retained Area 1 of the Aramco concession.[24]

Three other previously discovered fields, Bakr and Ramlah onshore and Al Qurayyin offshore, were confirmed by drilling and testing. Drilling operations were active dur-1975, although 45 fewer wells were completed than in 1974. Aramco crews drilled 255 wells in 1975, of which 101 were for oil production; 109 pressure maintenance, exploratory, and field delineation; and 45 wells for observation and water. In 1975 the company operated 18 onshore and 5 offshore drilling rigs and drilled a total of 452,800 meters, compared with 639,900 meters during 1974.

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[24] Arabian American Oil Co. Aramco 1975, A Review of Operations. Pp. 3–15.

The Mineral Industry of Liberia

By Janice L. W. Jolly [1]

The mineral industry of Liberia consisted of the production of iron ore, diamonds, gold, cement, and refined petroleum products in 1975. Despite an 18.2% increase in gross domestic product (GDP) from $565.5 million [2] in 1974 to an estimated $668 million in 1975, Liberia's economy was influenced by depressed market demand in the rest of the world. Total value of mineral exports decreased in 1975. Earnings from mineral exports fell because of reduced sales and lower market prices. Slackened demand resulted in growing iron ore stockpiles at ports. Diamond mining activities continued the decline that was evident in 1974 as the downward trend of the world diamond market reached even greater proportions by 1975. The iron ore industry was hit by a worldwide decline in production of steel and a slight lowering of price. In some cases, companies were obliged to stockpile ore to maintain full employment. Only companies with long-term contracts were able to continue production at full capacity. The Liberian Bureau of Mines again reported [3] that the resurgence of interest in gold mining experienced in 1974 continued to grow in 1975.

In May 1975, 15 West African countries put into force a treaty on cooperation and created the Economic Community of West African States (ECOWAS). In addition to Liberia, signators included Benin, Gambia, Ghana, Guinea, Guinea Bissau, Ivory Coast, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo, and Upper Volta. This agreement aims at eliminating obstacles to the free movement of goods, capital, and people, and accelerating and sustaining economic development in the subregion.

New markets were opened through signing of the Lome Convention with the European Economic Community (EEC), which already participates in 65% of Liberia's trade. The most noticeable change that the Lome Convention will make in Liberia's trade will be the lifting of tariff barriers on some products. Tariff discrimination by EEC arose from the previous Yaounde and Lagos agreements. Liberia was also eligible for increased trade benefits under the U.S. Trade Act of 1974.

A contract by the United Nations Industrial Development Organization (UNIDO) with Alexander Gibb and Partners of the United Kingdom for a study of the feasibility of a Liberian industrial free zone (IFZ) was completed. The report recommended establishment of an IFZ with 71 industrial plots, each with 1 acre at the port of Monrovia. A law establishing the IFZ Authority has already been promulgated. Foreign financing was sought. The IFZ was scheduled to become operational by mid-1978. The report recommended that the IFZ be developed in two stages over a 15-year period at an estimated cost of $32 million. Infrastructure construction would start in 1977.[4]

New development loans included $15 million from the World Bank for financing the Mesurado Bridge and Port Access Roads, the Ganta-Tototo Highway, and an integrated rural development program in Lofa County. The World Bank was also considering studies for increased hydro-

[1] Physical scientist, International Data and Analysis.

[2] Liberia uses U.S. dollar currency.

[3] Republic of Liberia. Report of the Liberia Ministry of Lands and Mines, Annual Report for the period Jan. 1, 1975 to Dec. 31, 1975. Unpublished Ministry report, Monrovia, Liberia, pp. a–u, and pp. 1–93.

[4] Journal of Commerce, Industry, and Transportation (Monrovia). Free Zone for Industry. July 1975, p. 16.

electric generation facilities necessary for the exploitation of ores from the Putu, Gbie, and Wologisi deposits.[5] The African Development Bank (ADB) made available $5.4 million for the road link between Sierra Leone and Liberia, and for other development projects of the Liberian Bank for Development and Investment (LBDI). Liberia also obtained $1.8 million from the Arab League's Arab Loan Fund for Africa. This is said to represent 50% of Liberia's total allocation from the fund. This the first known assistance from this source since the energy crisis, although a $100 million loan-investment proposal by the Flower Group of the United Kingdom and Gulf Development Co. (Persian Gulf) was still under consideration. The total allocation of $3.6 million from the Arab League for Liberia is less than 10% of the cost to Liberia for the oil price increase experienced in 1974. Other loans include $60.8 million from Japan for telecommunications and $9 million from the U.S. Agency for International Development (AID) for rural development and road construction.[6]

The Liberian Geological Survey formulated a mineral evaluation program for locating new mineral commodities to augment those presently exploited. A 5-year Mineral Evaluation Program was established coincident with the Government's 5-year development program; priority was given to gold evaluation, exploration, and quantification. A preliminary starting date was set for January 1975, with a termination date of December 30, 1980. However, funds to implement the project were still being awaited in 1975 from the Development Budget of the Ministry of Planning and Economic Affairs,[7] causing a delay in the planned project dates. The Liberian Cartographic Service launched a 5-year development plan in geodesy and cartography to meet the increased demands for maps and other geographic data by all sectors involved in the economic and municipal development projects.

PRODUCTION AND TRADE

Liberia's export earnings, valued at $405.6 million in 1975, were dependent upon two principal mineral commodities, iron ore (75%) and diamonds (5%). Although the rate of iron ore production was maintained throughout 1975, production was expected to decrease early in 1976. Consumers had begun to defer and cancel orders late in 1975 causing mining companies to stockpile unsold ore and exports to decline. In 1975, 18.4 million tons of iron ore was exported by four companies, of which about 3.1 million tons was in the form of pellets. The comparative figures in 1974 were 25.6 and 3.6 million tons, respectively. Bong Mining Co., Ltd. (BMC) increased production of pellets, but exported one-third less than in 1974.[8] Liberia's list of iron ore export recipients in 1975 included West Germany (25%), Italy (16%), the Netherlands (15%), the United States (11%), France (10%), and Belgium (7%).

Diamond exports for 1975 decreased 32.9% in quantity and 38.2% in value. For the period January 1 to December 15, 1975, diamond exports were valued at $17.8 million compared with $28.8 million for the same 1974 period. No accurate production figures can be given for the gold mined. All gold recovered was sold at mining sites either to jewelers or other interested buyers, who take their product to neighboring countries for better prices. This practice was expected to cease following issuance of a press release in May 1975 by the National Bank of Liberia that removed restrictions on the sale of gold.

[5] Work cited in footnote 4.
[6] Africa Report (New York). Loans and Grants, Liberia. V. 20, No. 5, September–October 1975, p. 40.
[7] Page 36 of work cited in footnote 3.
[8] Page H of work cited in footnote 3.

Table 1.—Liberia: Production of mineral commodities

Commodity [1]	1973	1974	1975 [p]
METALS			
Gold [e] ---- troy ounces	2,500	3,000	3,000
Iron ore ---- thousand metric tons	23,542	23,785	24,000
NONMETALS			
Cement, hydraulic ---- do	89	86	[e] 90
Diamond:[2]			
Gem ---- thousand carats	509	377	221
Industrial ---- do	308	259	185
Total ---- do	817	636	406
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	497	507	549
Jet fuel ---- do	205	259	282
Kerosine ---- do	91	81	75
Distillate fuel oil ---- do	1,646	1,351	1,253
Residual fuel oil ---- do	1,304	1,527	1,555
Other ---- do	23	28	30
Refinery fuel and loss ---- do	223	254	218
Total ---- do	3,989	4,007	3,962

[e] Estimate. [p] Preliminary.
[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] Exports.

Table 2.—Liberia: Exports and reexports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal including alloys, all forms	(1)	1	All to United States.
Iron and steel:			
Ore and concentrate thousand tons	25,574	25,592	West Germany 6,191; Netherlands 4,876; United States 2,752; France 2,324.
Semimanufactures	44	87	Italy 79.
Silver metal including alloys troy ounces	581	--	
Other, nonferrous metal scrap -- value	$326,536	$299,490	Spain $110,000; West Germany $81,696; Italy $57,300.
NONMETALS			
Abrasives, natural, grinding and polishing wheels and stones, n.e.s	19	(1)	All to West Germany.
Cement	266	344	Sierra Leone 304; Guinea 40.
Diamond, industrial ---- carats	812,257	635,723	Belgium-Luxembourg 349,614; United Kingdom 159,169; Israel 49,646.
Fertilizer, manufactured nitrogenous	--	25	All to Dahomey.
Salt	--	22	All to Guinea.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline ---- 42-gallon barrels	5,785	10,234	Guinea 6,428; Sierra Leone 3,806.
Kerosine ---- do	--	292	Guinea 277.
Distillate fuel oil ---- do	61	728	Sierra Leone 688.
Lubricants ---- do	524	452	Sierra Leone 367; Guinea 60.

[1] Less than ½ unit.

Table 3.—Liberia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Oxide and hydroxide	(1)	2
Metal including alloys, all forms	519	528
Arsenic trioxide, pentoxide, and acid	--	1
Chromium oxide and hydroxide	20	--
Copper metal including alloys, all forms	21	45
Iron and steel metal:		
Scrap	--	20
Pig iron, ferroalloys, and similar materials	17	26
Steel, primary forms	81	435
Semimanufactures:		
Bars, rods, angles, shapes, sections	3,003	3,960
Universals, plates, sheets	6,099	7,782
Hoop and strip	46	15
Rails and accessories	1,400	814
Wire	47	72
Tubes, pipes, fittings	2,698	2,732
Castings and forgings, rough	1,376	385
Lead metal including alloys, all forms	25	59
Nickel metal including alloys, all forms	(1)	2
Platinum-group metals and silver:		
Ore and concentrate ——— value	$412	--
Metal including alloys:		
Platinum group ——— troy ounces	21	1
Silver ——— do	3,424	158
Tin metal including alloys, all forms	--	2
Zinc metal including alloys, all forms	10	16
Other:		
Ore and concentrate of nonferrous base metals ——— value	$388	$152
Nonferrous metal scrap ——— do	$813	--
Oxides, hydroxides, and peroxides of metals, n.e.s	184	18
Metals including alloys, all forms:		
Metalloids	7	8
Alkali, alkaline earth, and rare-earth metals, n.e.s	15	36
NONMETALS		
Abrasives, natural, n.e.s.:		
Grinding and polishing wheels and stones	387	218
Other ——— value	$77,361	$9,500
Asbestos	10	5
Boron materials, oxide and acid	2	(2)
Cement	59,483	49,103
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	1,337	19,860
Products:		
Refractory (including nonclay bricks)[3]	159	102
Nonrefractory[4]	495	1,014
Diamond:		
Gem ——— carats	--	272
Industrial ——— do	278	--
Fertilizer materials:		
Natural:		
Nitrogeneous	1,561	3,962
Phosphatic	39	3
Potassic	--	167
Manufactured:		
Nitrogenous	9,376	34,359
Phosphatic	1,213	3,618
Potassic	715	2,902
Other including mixed	191	3,205
Ammonia	1,318	1,938
Gypsum and plasters	5,559	10
Lime	1,027	1,912
Mica, worked	(1)	(1)
Salt	3,389	4,319
Sodium and potassium compounds, n.e.s.:		
Caustic soda	1,218	1,911
Caustic potash, sodic, potassic peroxides	27	20
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	2,393	1,653
Worked ——— value	$38,620	$65,547
Dolomite, chiefly refractory grade	16,791	15,599
Gravel and crushed rock	6,070	8,175
Sand, excluding metal bearing	15	165

See footnotes at end of table.

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

Commodity	1973	1974
NONMETALS—Continued		
Sulfur:		
Elemental (includes unroasted pyrites)	107	1
Sulfuric acid	77	290
Other nonmetals, n.e.s.:		
Crude ... value	$16,502	$5,795
Oxides and hydroxides of magnesium, strontium, barium	--	2
Bromine, iodine, fluorine	2	--
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s ... value	$497,466	$810,758
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	8	24
Carbon black	4	5
Coal and coke, including briquets	11,040	5,952
Hydrogen and other rare gases ... value	$14,737	$8,870
Petroleum:		
Crude and partly refined ... thousand 42-gallon barrels	3,276	4,374
Refinery products:		
Gasoline ... do	7	6
Kerosine and jet fuel ... do	1	5
Distillate fuel oil ... do	3	5
Residual fuel oil ... do	(1)	(1)
Lubricants [5] ... do	111	143
Other:		
Liquefied petroleum gas ... value	$13,460	$1,712
Mineral jelly and wax ... thousand 42-gallon barrels	1	1
Nonlubricating oils, n.e.s ... value	$26,247	$39,777
Other ... do	r $35,026	$62,585
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 90	31

r Revised.
1 Less than ½ unit.
2 Value only reported at U.S. $1,392.
3 Excludes quantity valued at $29,168 in 1973 and $20,532 in 1974.
4 Excludes quantity valued at $34,436 in 1973 and $21,554 in 1974.
5 Excludes quantity valued at $27,499 in 1973 and $159,726 in 1974.

COMMODITY REVIEW

METALS

Gold.—The National Bank of Liberia announced on May 5, 1975, that it would buy gold from financial institutions at $42.00 per fine troy ounce, but would not place any restriction on public buying, selling, or dealing in gold above that price. The Government's gold evaluation and exploration program created sufficient interest among the local population to produce a 42% increase in gold mining licenses issued in 1975 compared with those of 1974. A total of 69 prospecting and 56 gold mining licenses were issued for claims in all counties except Bong County.[9]

The following companies applied to the Government for mineral-concession rights for gold: Hydrocarbon Industries, Ltd., Bruce Clayman and Associates, Trico Mining Corporation, and Azuza Mining Corporation. African Mining Partners continued exploration in the Weaju, Jenne Wonde, and Gondoja areas of Grand Cape Mount County until the end of March, when it abandoned the Butterhill area and transferred all exploration to Grand Gedeh County.

The Liberian Geological Survey continued to implement a 3-year quantification program of all gold-bearing areas in the country. Areas investigated since 1974 were the Todee District (Montserrado County), Bentol-Mount Coffee area, Webbo/Karloke area, and Grand Gedeh County. Results were encouraging. A total of 252 placer gold samples from the eastern and western regions were processed and evaluated. Many were too low to warrant further investigation at that time.

Heavy Minerals.—An initial investigation covering a cross sample of 7% (45 kilometers) of the Liberian coast disclosed reserves of 700,000 tons containing an average of 40% heavy minerals, including a concentration of 192,000 tons of ilmen-

[9] Page H of work cited in footnote 3.

ite, 33,000 tons of zircon, 12,000 tons of rutile, and 4,000 tons of monazite.[10] Large areas of yellow, unconsolidated beach sand with a 50% heavy-mineral concentration occur at depths of 6 to 9 meters, in addition to those previously described in sands at the sediment surface.

Liberian Beach Sands Exploitation Company (LIBSEC), a Netherlands syndicate under a 25-year concession, will exploit the heavy minerals between the Cestos and Cavalla Rivers. No new exploration activities were executed by LIBSEC in 1975. The 20-ton bulk sample collected in 1974 consumed considerably more time and money in testing and shipping than anticipated. Readings of Limore, an Australian company, received the sample in February 1975. An economic feasibility study was being executed by V. G. Bennet and Associates Pty., Ltd., beach sand mining consultants from Brisbane, Australia. Two engineers of Bennet spent 2 weeks in Liberia in June. No final decision from LIBSEC was expected before sometime in 1976. It was anticipated that extra chemical treatment of the zircon to remove iron will be necessary before it is salable. Total expenditure by LIBSEC for 1975 was $134,428.

The Liberian Geological Survey evaluated 406 heavy-mineral concentrations for economic potential. Minerals of possible economic significance include the following:[11]

Chrysoberyl.—Several grains had been recognized in the washed gravels from Lofa River near Yangaya Town, Lofa County. Plans were being made to make a survey of the pegmatites in this area.

Chromite.—The source is the several ultramafic rocks that exist in western Liberia. Detailed geophysical and geochemical studies were planned to determine the potential of these bodies.

Ruby Corundum.—Corundum occurs as a major mineral associated with the diamond placers in Liberia. Most is of the gray variety, but occasionally pink grains (less than 1% of the total) are also found. Large grains of gem quality can be obtained as a byproduct of gold and diamond mining. Gray corundum can be used as an abrasive. Large quantities are reportedly available and presently are regarded as waste.

Monazite and Xenotime.—Both have been recognized in all mineral samples and occur in almost every proportion. Monazite is the most common heavy mineral except for ilmenite and zircon.

Rutile.—Like monazite, rutile is recognized in nearly all heavy-mineral concentrates. Coarse-grained rutile is common in the Tawalata area. A columbium-bearing variety has also been identified.

Iron Ore.—Technical studies were completed on Liberian Iron and Steel Corp.'s (LISCO) Wologisi iron ore project. An investment decision was to be made in 1976 with expected costs to be in excess of $700 million.

BMC was planning a second pelletizing plant of 2.4 million tons per year. Startup was scheduled for 1977. This would bring the total annual production to 7.5 million tons, consisting of 4.8 million tons of pellets and 2.7 million tons of concentrates. BMC has been studying the second plant for more than 2 years. An important consideration in planning was the increasing demand for pellets as the most suitable furnace feed. Also, the increasing ultrafines content of the BMC concentrate reduces its suitability as sinter feed. The following new facilities were required: Additional mining equipment to provide more crude ore, expansion of grinding capacity of the concentrator because of increasing hardness of the ore, erection of an 11th concentrating line to raise the concentrate production 10%, and process improvements to increase iron recovery and adjust for the decreasing grain size of the ore. Final beneficiation to 66% iron and a constant silica content of 5% to 6% will be achieved by indirect flotation after regrinding to pellet fineness. Because of the increase in the production capacity, other facilities will also require expansion. The powerplant capacity will be increased from 68 to 95 megawatts, and the harbor and railroad will be extended. The entire expansion program was estimated to require a $120 million investment.[12] Allis-Chalmers Corp. has signed a license agreement with the West German Thyssen Rheinstahl Technik GmbH to supply the facilities for the BMC pelletizing plant. Thyssen will be responsible for management, engineering, and equipment. The equipment will be manufactured under

[10] Page 22 of work cited in footnote 4.
[11] Pages 34–36 of work cited in footnote 3.
[12] Skillings' Mining Review (Duluth, Minn.). Bong Plans to Construct Second Pellet Plant in Liberia. V. 64, No. 32, Aug. 9, 1975, p. 22.

license according to Allis-Chalmers specification.

BMC continued to explore and study deposits in the Putu Range. A recent agreement was made between BMC and a consortia of German and Japanese interests to finance feasibility and technical studies for the Putu deposits. Reserves were estimated at 350 million tons with 38% iron. Construction of pelletizing plants with a capacity of 8 million tons per year were anticipated. The Japanese companies include Nippon Steel Corporation, Nippon Kokan K.K., Sumitomo Metal Industries Ltd., and two trading companies, Sumitomo Shoji Kaisha, Ltd., and Nichimen Co., Ltd. The West German firm was Exploration and Bergbau GmbH (a joint exploration company owned by August Thyssen-Hütte AG, Friedr Krupp Hüttenwerke AG, Rheinstahl AG, and ESTEL N.V.). The German group reportedly had completed a survey of the initial phase. The Japanese will provide $1.5 million to finance the second-phase survey. Negotiations with the Liberian Government of development and production terms were in progress. The United Workers Congress of Liberia (UWC) and BMC signed a contract on September 30, 1975, making UWC the leading mine labor union in Liberia.

Sensing an easing of demand, Liberian American-Swedish Minerals Company (LAMCO) continued high production in the first half of 1975 to build stockpiles but, on July 1, cut its production work week to 5½ days and its production rate to 9 million to 10 million tons per year. LAMCO is continuing to explore other deposits near its Nimba operation and is planning a $140 million expansion at its Tokadeh operation. Although LAMCO's ore shipments were lower in 1975 than in 1974, the company's earnings were higher. Improvements were attributable to price increases negotiated during the latter part of 1974. Shipments from the LAMCO mine in the first 6 months of 1975 were approximately 4.3 million tons, down from 5.2 million tons during the same 1974 period. LAMCO was negotiating with Guinea for possible ore shipment from deposits of the Guinean Iron Mining Co. (MIFERGUI) on the LAMCO railroad. LAMCO was investigating the possibility of electrifying its railroad to increase transport efficiency.

The Liberia Mining Co., Ltd. (LMC) Bomi Hills mine was gradually phasing out operations. LMC will continue to operate as long as old equipment and the limited iron ore supply last. LMC's ore reserves are reportedly being extended every 3 to 4 months and upgraded by using selective mining to blend high-grade material with low-grade ore to produce a salable product. LMC was expected to continue operations through 1976, but at a decreasing production rate. LMC is also continuing to explore at Bie Mountain near the Sierra Leone border.

Production at the Mano River mine of National Iron Ore Co., Ltd. (NIOC), increased in the first half of 1975 to 1,561,637 tons from 1,230,137 tons produced in the first half of 1974. The increase was primarily due to solving some of its production problems. Problems confronting NIOC included poor quality of ore (compared with that of other Liberian firms), high content of waste, fine-grained ore texture, and complex geological structures. Some major mining problems have included beneficiation, maintenance of adequate tailings storage and all-weather roads, contamination of water, and acquisition of special equipment. Disposal of tailings is a continuous challenge to the operation of Mano and its efforts in environmental control. NIOC suffered financial losses in development of the Mano Two project, caused by miscalculations and faulty equipment. Of a total $10 million for Mano Two invested on new equipment, $2 million to $3 million were spent on faulty equipment.[13] The labor force employed was larger than required, and management fees were high. A new General Manager was appointed early in 1975 as part of an effort to solve some of the problems.

Erection of an integrated West African steel mill at Buchanan was being considered by the Liberian Government. The Economic Commission for Africa (ECA) was studying arrangements for cooperation of countries of the West African subregions in this project.[14]

NONMETALS

Barite.—The Lofa Construction Company, Inc., in 1975 applied for mineral-

[13] Pages 14–16 of work cited in footnote 3.
[14] Page 20 of work cited in footnote 4.

concession rights for barite. A concession was granted to Universal Mineral and Oil Co., Ltd., which was carrying out extensive exploration in an area where 13 veins had been reported.

Diamond.—A total of 438 mining licenses for diamonds was issued by the Liberian Bureau of Mines along with 290 prospector's licenses and and 21 broker's licenses. Globex Minerals (Liberia) Inc. continued exploration around the Lake Piso area. Diamond production by Globex was 1,336.4 carats valued at $51,212 in 1975. The company was now in its third year of operation. Gold was also found to be an important constituent in the Lofa River diamond gravels and was made part of Globex's exploration program. Konte Mining Trading Corp. and Bulaco Corp. made application for mineral-concession rights for diamonds in 1975.

The Mineral Industry of Libya

By John L. Albright [1]

Petroleum and natural gas continued to be the most important mineral commodities in the Libyan economy, but 1975 was unrestful for these hydrocarbon industries as Government actions adversely affected production and marketing of both commodities. In 1974 the Government had called for a significant increase in the export price of liquefied natural gas (LNG) by Esso Standard Libya, Inc. The company's production and exports of LNG fell during the latter part of 1974 and early part of 1975, while the firm negotiated new sales agreements with its European customers; Esso's oil production was also curtailed during this period, as the Government refused to allow flaring of associated gas normally processed into LNG for export. BP Exploration Company (Libya) Ltd. withdrew its claims against the Government that previously had been publicized because of the 1971 Libyan nationalization of BP's interest in the prolific Sarir oilfield. The Nelson Bunker Hunt Petroleum Co. reached final settlement with Libya for the 1973 nationalization of its share of the Sarir oilfield.[2] An altercation took place during the year between Occidental of Libya, Inc., and the Government that adversely affected Occidental's operations in Libya.[3]

Concerned with reduced sales of crude oil during the previous year that had been attributed in part to high prices, Libya lowered its price of 37-degree gravity crude oil in January 1975 to $11.86[4] per barrel from $12.50 per barrel and lifted its embargo on exports of crude oil to the United States and several other Western countries. Prices for the 37-degree gravity oil were further reduced three more times during the first half of 1975. The June 1, 1975 price was set at $11.10 per barrel.[5]

Libya's development budget for 1975 was set at approximately $3,752 million, of which about $283 million or 7.5% was designated for projects in the petroleum sector of the economy. Contracts were awarded for the construction of extensive facilities at Marsá al Burayqah (Brega) to produce petrochemicals. The new complex, scheduled to be completed in 1978, will produce ammonia (rated at 2,000 tons per day), ethylene (rated at 1,000 tons per day), methanol (rated at 1,000 tons per day), and urea (rated at 2,700 tons per day).[6]

India and Libya held discussions during the year on numerous petroleum industry-related projects. India proposed participating in oil exploration in Libya, and the two countries agreed to form a joint company to service oil wells in Libya. The Indians will also supply petroleum industry training facilities to Libya. Indian and Libyan delegations also discussed the possibility of joint petrochemical projects. The output would be marketed mainly in India, which may assist Libya in building a 400-kilometer crude oil pipeline from the Western Desert to the Mediterranean Sea. Libya and Pakistan held talks during the year concerning several joint projects that may be undertaken in Pakistan, including

[1] Mineral specialist (petroleum), Division of Petroleum and Natural Gas.
[2] Petroleum Intelligence Weekly. Libya Compensates Bunker Hunt for 1973 Oil Takeover. V. 14, No. 36, Sept. 8, 1975, p. 4.
[3] Petroleum Times. Occidental in Dispute With Libya Warns Possible Purchasers of Zuetina Crude. V. 79, No. 2014, Oct. 17, 1975, p. 15.
[4] Where necessary, values have been converted from Libyan pound (£L) to U.S. dollars at the rate of 1£L=US$3.38.
[5] The Petroleum Economist. Libya Trims Prices. V. 42, No. 8, August 1975, pp. 289–291.
[6] Middle East Economic Survey (Beirut, Lebanon). Libya's Petrochemical Complex at Brega Takes Shape. V. 18, No. 25, Apr. 11, 1975, pp. 5–6.

the establishment of a fertilizer plant, an investment company, and a maritime shipping company. Libya also discussed several petroleum industry development projects with Romania, and the Romanians plan to explore for oil in Libya. Under the terms of an economic agreement signed during the year, the Austrian Government will provide Libya with assistance in developing its petroleum industry and transportation systems, and Libya pledged to step up deliveries of crude oil to Austria in the future. Argentina and Libya signed an agreement in 1975 for cooperation in the field of atomic energy, whereby the South Americans would assist Libya in exploring for radioactive ores.

PRODUCTION

Oil output decreased for the fifth consecutive year and totaled only 551 million barrels in 1975, less than one-half of Libya's record output of 1,209 million barrels recorded in 1970 and down 4.1 million barrels or about 1% from 1974. Ten petroleum companies were engaged in producing crude oil. Despite the declining rate of output, Libya maintained its position as the second largest oil producer after Nigeria in Africa. During 1975, the average daily rate of crude oil production sunk to an 11-year low of 912,100 barrels in February, increased steadily during the second quarter of the year after several substantial price reductions, and reached the year's highest rate of production at 2.1 million barrels per day in July. In September the Government ordered cuts in production, and the total oil output fell by 302,200 barrels per day during the month.

Table 1.—Libya: Production of mineral commodities

Commodity [1]	1973	1974	1975 [p]
NONMETALS			
Cement, hydraulic ....thousand metric tons..	79	500	615
Gypsum ....do....	[e] 4	3	[e] 4
Lime ....do....	[e] 20	20	14
Salt ....do....	[e] [r] 10	10	[e] 10
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural:			
Gross production ....million cubic feet..	[r] 575,026	425,363	489,035
Marketed [2] ....do....	385,246	345,199	382,633
Petroleum:			
Crude ....thousand 42-gallon barrels..	793,839	555,291	551,150
Refinery products:			
Gasoline ....do....	511	618	532
Kerosine and jet fuel ....do....	516	345	256
Distillate fuel oil ....do....	840	760	639
Residual fuel oil ....do....	1,168	1,219	1,026
Other ....do....	172	--	--
Refinery fuel and losses ....do....	42	51	63
Total ....do....	3,249	2,993	2,516

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

[1] In addition to the commodities listed, construction material 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 reinjected to reservoirs, if any.

TRADE

Libya's mineral trade was dominated by exports of crude oil and natural gas. The Libyan National Oil Corp. (LINOCO) was the largest exporter. Libyan crude oil was loaded onto tankers for export at five terminals: Az Zuwaytīnah, Brega, As Sidr, Ra's al Unūf, and Ṭubruq. Trade agreements were negotiated with several foreign countries during the year. The Italian company Ente Nazionale Idrocarburi (ENI) signed a trade agreement with Libya for the purchase of up to 91 million barrels of crude oil per year. Two-thirds of ENI's liftings will be from the Bu Attifel oilfield and one-third from other Libyan oilfields. Libya agreed to use part of the income from the oil deliveries to ENI for the purchase of Italian goods and services to be utilized in the petroleum industry. Under terms of an agreement reached with Turkey, Libya is to supply that nation in 1975 with nearly 23 million barrels of crude oil and 2 million barrels of refined petroleum products at favorable prices. The Libyan-Turkish talks included future deliveries of petroleum and natural gas to Turkey, the formation of a joint tanker fleet, and the construction of a petrochemical complex in Turkey. Spain concluded the purchase of nearly 198 million barrels of Libyan crude oil to be delivered from 1975 to 1980. According to the agreement, Spain would receive 3.8 million barrels of oil in 1975; 34.3 million barrels in 1976; 38 million barrels each during 1977, 1978, and 1979; and 45.7 million barrels in 1980. The trade talks between Libya and Yugoslavia included future Libyan oil exports and cooperation by the two countries in petrochemical projects.

Table 2.—Libya: Crude oil exports by country

(Thousand 42-gallon barrels)

Country	1973	1974	1975 p
Austria	4,524	4,052	1,022
Bahamas	31,784	13,834	26,244
Belgium-Luxembourg	19,896	10,841	2,044
Brazil	9,294	24,674	15,951
Bulgaria	6,006	1,944	840
Canada	12,598	3,030	4,198
Denmark	1,272	1,643	840
Egypt	5,297	1,132	NA
France	44,252	34,412	19,601
Germany, West	181,452	120,414	103,952
Greece	14,282	NA	NA
Italy	206,579	183,522	107,347
Japan	6,445	23,579	17,338
Liberia	196	NA	NA
Netherlands	31,427	4,891	10,549
Norway	1,408	NA	NA
Romania	9,491	1,460	6,315
Spain	11,996	20,002	23,543
Sweden	373	NA	NA
Switzerland	11,865	7,629	2,373
Trinidad and Tobago	3,570	--	4,818
Turkey	187	NA	NA
United Kingdom	90,935	66,759	18,396
United States	74,910	475	116,581
U.S.S.R	12,906	NA	NA
Yugoslavia	742	NA	NA
Not specified	--	19,667	40,436
Total	793,687	543,960	522,388

p Preliminary. NA Not available.

Source: Libya Department of Census and Statistics, External Trade Statistics 1973 and Organization of the Petroleum Exporting Countries, Annual Statistical Bulletin, 1975.

COMMODITY REVIEW

METALS

Aluminum.—Libya held preliminary discussions with Yugoslavia concerning the establishment of an alumina facility in Yugoslavia and an aluminum smelter in Libya. The two countries did not reveal the proposed output capacities or sites for the plants.

NONMETALS

Cement.—Contracts totaling an estimated $110 million were awarded to two West German firms for the construction of a cement plant near Banghāzī with an annual production capacity of 1 million tons,[7] and further expansions to the industry will raise Libya's cement production to 5 million tons in 1980.

MINERAL FUELS

Natural Gas.—During the fourth quarter of 1974 and the first quarter of 1975, Esso encountered interruptions in marketing its LNG from the Brega plant because of a dispute with its European customers over an increase in the price of the LNG. Esso continued shipments to Spain during the dispute, but deliveries to Italy, Esso's primary customer, were halted in October 1974 and did not resume until early in 1975.[8]

Yearend 1975 reserves of natural gas were estimated to total 28.5 billion cubic feet, a decrease of approximately 0.7% from the yearend 1974 reserves. Libya's natural gas reserves were the third largest in Africa, after those of Algeria and Nigeria.

Petroleum.—Petroleum industry drilling activities fell sharply from those of 1974, when 72 wells were drilled. According to the Libyan official news agency, only 14 wells were drilled during 1975, of which 8 produced oil and the remainder were dry holes. A discovery well in the Sirtica Basin was tested by Occidental at a rate of 2,400 barrels of oil per day. Under the terms of Occidental's agreement with LINOCO, any oil and gas produced from the area will be shared 19% by Occidental and 81% by the Government. Aquitaine Libye brought one well in its El Meheiriga oilfield into production during 1975 at an average rate of 8,900 barrels of oil per day, and a second well was tested at the field. Under the terms of the agreement concluded in 1974 between the company and the Government, production will be shared 85% to 15%, with the Government obtaining the larger share.

In 1975 representatives of several foreign companies discussed petroleum exploration arrangements with Libya. The Italian firm ENI concluded an agreement to explore nine tracts of land covering nearly 60,000 square miles, with the stipulation that any commercial production from the area would be shared 51% to 49%, with the Government acquiring the larger share. Libya and India held talks during the year concerning the possibility of India's Oil and Natural Gas Commission exploring for oil in Libya, and Libya reportedly negotiated an agreement with Romania for oil exploration and well drilling in Libya. Details of the agreement were not released.

Libyan crude oil reserves maintained their position as Africa's largest, and at yearend 1975 they were estimated to total 24 billion barrels, an increase of 1 million barrels or 4.3% from 1974.

A dispute took place during 1975 between Occidental and the Government concerning the oil company's marketing and its payments to Libya. The Minister of Petroleum ordered Occidental to cut oil production in September to 196,000 barrels per day, and during the fourth quarter of 1975 the Government suspended the company's crude oil liftings from the Zuetina terminal when Occidental suspended payments to the Government. In December, negotiations resulted in new agreements, and Occidental resumed its crude oil exports and payments to the Government. The new agreements permit the oil company to produce up to 300,000 barrels of oil per day for a period of 5 years; the output level would then be lowered to not less than 275,000 barrels per day during the next 3 years and to not less than 250,000 barrels per day during

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7 Middle East Economic Survey (Beirut, Lebanon). Libya Awards $110-Million Contract for Cement Plant to West German Firms. V. 18, No. 14, Jan. 24, 1975, p. 5.

8 Petroleum Economist. Cheaper Oil but Dearer Gas. V. 42, No. 3, March 1975, p. 95.

the following 2 years. Occidental will have the right to buy back the Government's share of the company's oil production.[9]

Operating problems were encountered at the Az Zāwiyah petroleum refinery on the western coast near the border with Tunisia, but the plant's output reached the designed capacity level of 60,000 barrels per day during the year. Output included fuel oil, jet fuel, kerosine, liquefied petroleum gas (LPG), lubricating oil, and motor gasoline. The Italian firm Snam Progetti S.p.A. was engaged in expanding the Az Zāwiyah refinery; when the facility is completed, it will have a crude oil throughput capacity of 120,000 barrels per day. LINOCO contracted Snam Progetti to supervise the construction of a 220,000-barrel-per-day petroleum refinery at Ţubruq on the eastern coast near the border with Egypt. Libya also developed plans during the year for building refineries at Mişrātah (near Ţarābulua) and Az Zuwaytīnah (near Banghāzī) but dropped them because of the uncertain world demand for petroleum products.[10]

The capacity of the Mişrātah plant would have been the same as that of the Ţubruq refinery, and the capacity of the Az Zuwaytīnah refinery was to be set at 400,000 barrels per day, Africa's largest. The Libyan Petroleum Institute planned to establish a petroleum refinery simulator at Qarqārish to be used in training petroleum industry personnel. Simulated equipment at the training facility will include control gauges and valves, a control room (which will utilize a computer), processing units, storage tanks, and other equipment that would be encountered in a petroleum refinery.[11] LINOCO and the Yugoslavian firm Servina signed an agreement to establish a joint petroleum refinery at Koper, Yugoslavia. In 1974 the two firms discussed the project and set the throughput capacity for the Koper refinery at 160,000 barrels of oil per day. LINOCO also held discussions with the Italian firm ENI concerning possible Libyan participation in Italian refining operations.

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[9] Oil and Gas Journal. Oxy, Libya Settle Production Dispute. V. 73, No. 50, Dec. 15, 1975, p. 53.

[10] Petroleum Intelligence Weekly. Libya Slashes Plans for Export Refining Due to World Slump. V. 14, No. 21, May 26, 1975, p. 3.

[11] Petroleum Times. Libya to Set Up Refinery Simulator. V. 79, No. 2004, Mar. 21, 1975, p. 11.

The Mineral Industry of Malaysia

By E. Chin [1]

The Malaysian gross national product (GNP) in 1975 was $8.7 billion in current dollars [2] compared with $8.8 billion in 1974. In terms of 1970 constant dollars, the real growth in GNP was 2.5% in 1975 and 8.4% in 1974. The gross domestic product (GDP) in 1975 was $6.1 billion in 1970 dollars and was distributed by sectors as follows, in billion dollars: Agriculture, forestry, and fishing, 1.8; manufacturing, 0.9; wholesale and retail trade, 0.8; transport, storage, and communications. 0.4; construction, 0.3; mining and quarrying, 0.2; electricity and water, 0.2; and other, 1.5. The value of production by the mining and quarrying sectors was down only 1.1% from that of 1974. The increase in oil production nearly offset the decline in quantity of tin-in concentrate and bauxite produced in 1975.

Tin production in Malaysia accounted for almost 29% of the total world production in 1975. Moreover, Malaysian tin mine output was more than twice the output of the next largest tin producing country. At one time, production of tin and rubber were the basis of the Malaysian economy. Because of the growth of the palm oil industry, tin has fallen to third place and was likely to surrender that position in the economy to the petroleum and copper industries, and perhaps even to timber. The Government stated that the tin industry was likely to grow slowly unless new commercial ore deposits were found. Because of the worldwide decrease in demand for tin in 1975, fluctuations in prices, and export controls, 94 small, marginal mines were reportedly closed during the year.

Under the terms of the Petroleum Development Act, the Government set up Petroleum Nasional Berhad (Petronas), which was empowered to acquire effective control of foreign companies through the issuance of management shares. Pending resolution of negotiations with Petronas by foreign companies, new exploration was at a virtual standstill during 1975. The companies affected were Esso Production Malaysia, Inc. (Esso), Picten Malaysia Co., Sabah Shell Petroleum Co., and Sarawak Shell Berhad. The key points being negotiated were increased cost-recovery allowances, a 70%–30% after-cost profit split before taxes (70% going to the Government), and production-sharing rights for a sufficient time to allow investment recovery and an adequate return on investment.

The Government established guidelines to regulate acquisitions, mergers, and takeovers of companies and businesses.[3] The primary objectives of guidelines were to discourage those forms of foreign investment that confer no visible benefits to the national economy and would perpetrate the present imbalances that exist in the pattern and structure of ownership and control of companies and businesses. Private investments which would contribute to the development of the country, consistent with the Government's economic policy, would be welcomed and encouraged.

The acquisition, merger, and takeover of companies and businesses by foreign or Malaysian interests should: (1) Result directly or indirectly in a more balanced Malaysian participation in ownership and control; (2) lead directly or indirectly to net economic benefits in relation to such

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[1] Physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from Malaysian dollars (M$) to U.S. dollars at the rate of M$2.50=US$1.00.

[3] Economic Report 1976–77. Ministry of Finance, Malaysia. Oct. 29, 1976.

matters as the extent of Malaysian participation, ownership, and management; income distribution; growth; employment; exports; quality and range of products and services; economic diversification; processing and upgrading of local raw materials; training; efficiency; and research and development; and (3) not have adverse consequences in terms of national policies in such matters as defense, environmental protection, or regional development. Moreover, proof that the proposed acquisition, merger, or takeover is not against the objectives of the Government's economic policy rests with the acquiring party.

PRODUCTION

The principal, commercially exploited mineral resources of Malaysia, in addition to mineral fuels, in order of value, were placer tin, heavy mineral deposits (beach sands), bauxite, and iron ore. In the mining and quarrying sector, tin was the country's largest foreign exchange earner. In 1975, a total of 64,363 tons of tin-in-concentrate was produced, valued at $0.41 billion. The value of production of ilmenite, zircon, monazite, wolfram, columbite, scheelite, and xenotime from heavy mineral sands was $6.28 million of which zircon and ilmenite accounted for 40% and 32%, respectively. Production of bauxite was 703,561 tons, down 26% from the 1974 output level. The decrease in production was attributed more to the gradual depletion of deposits rather than to a decline in demand for aluminum raw materials. Production of iron ore was 348,200 tons, down 28% from the 1974 output. The production decline was due to lower tenor of the ore deposits and to reduced demand by Japan, the major export destination. Production of manganese ore increased by 48,046 tons, reaching 133,308 tons in 1975, valued at $3.12 million. Output of mine gold was mostly from West Malaysia and the remainder from Sarawak. Copper production was about 14,000 tons, all from the Mamut area in Sabah.

The most notable prospect in the mineral industry was Malaysia's potential in petroleum production. Crude oil production in 1975 was 35,774,000 barrels, an increase of 21% over the 1974 level. Output was expected to increase another 60% in 1976 so that petroleum exports would become the second major export earner after rubber, overtaking tin and palm oil.

Table 1.—Malaysia: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity [2]	1973	1974	1975 p
METALS			
Aluminum, bauxite, gross weight ....thousand tons..	1,143	948	704
Antimony, mine output, metal content (Sarawak)	250	200	e 200
Columbium and tantalum concentrates, gross weight	r 92	83	e 75
Copper, mine output, metal content e 3	50	50	40
Gold, mine output, metal content:			
West Malaysia ....troy ounces..	2,730	3,435	2,484
Sarawak ....do....	r 939	1,004	1,192
Total ....do....	r 3,669	4,439	3,676
Iron and steel:			
Iron ore and concentrate ....thousand tons..	517	481	348
Pig iron and ferroalloys e ....do....	r 200	r 230	230
Crude steel ....do....	200	230	230
Manganese ore and concentrate, gross weight	28,346	85,262	133,308
Rare-earth minerals: 4			
Monazite, gross weight	r 1,942	1,783	3,285
Xenotime (yttrium mineral), gross weight	208	102	53
Tin:			
Mine output, metal content	r 72,262	68,124	64,363
Smelter output 5	r 82,469	84,396	83,068
Titanium, ilmenite concentrate, gross weight 4	184,414	153,530	112,248
Tungsten, mine output, metal content	r 135	131	106
Zirconium, zircon concentrate, gross weight 4	3,142	2,753	10,357

See footnotes at end of table.

Table 1.—Malaysia: Production of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity[2]	1973	1974	1975 p
NONMETALS			
Cement, hydraulic ----thousand tons--	1,278	1,364	1,446
Clays, kaolin ----	r 106,010	146,374	16,795
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural (Sarawak):			
Gross production e ----million cubic feet--	35,000	31,000	38,000
Marketed production ----do----	3,187	2,800	3,137
Petroleum:[6]			
Crude ----thousand 42-gallon barrels--	r 33,054	29,537	35,774
Refinery products:			
Gasoline ----do----	r 3,322	4,052	3,942
Jet fuel ----do----	r 4,811	657	1,055
Kerosine ----do----	2,051	2,153	1,938
Distillate fuel oil ----do----	r 6,461	6,351	6,169
Residual fuel oil ----do----	r 8,943	9,929	10,039
Other ----do----	r 9,381	8,724	4,965
Refinery fuel and losses ----do----	r 2,083	1,495	948
Total ----do----	r 37,052	33,361	29,056

e Estimate. p Preliminary. r Revised.

[1] All production is from West Malaysia unless otherwise indicated.

[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 small production of tin from smelter in Singapore.

[6] Includes production from Sarawak and West Malaysia.

TRADE

Total Malaysian exports in 1975 were valued at $3,688 billion. Principal destinations were Southeast Asian countries, Europe, the United States, Japan, and others, in that order. Exports of major commodities were as follows in million dollars: Rubber, 810; palm oil, 527; tin and tin-in-concentrates, 482; crude petroleum, 344; and lumber, 268. In addition to shipments of crude oil, exports of petroleum products in 1975 totaled 342,000 tons and were valued at $41.6 million.

Tin, third after rubber and palm oil as a major foreign exchange earner, was the leading export among mineral commodities. Exports of tin, primarily to the United States and Japan, totaled about 78,000 tons, down 9.1% from shipments in the previous year. The average unit value of tin and tin-in-concentrates exported in 1975 was $6,170.40 per ton compared with the high unit value received in, 1974 of $7,046.40.

Imports in 1975 totaled $3,402 billion and, in order of value, were chiefly from Europe, Japan, Southeast Asian countries, the United States, and Australia. By industrial classification, imports were distributed by value as follows, in percent: Machinery and transport equipment, 33%; consumer durable and nondurable goods, 21%; food, beverages, and tobacco, 18%; mineral fuels, 12%; chemicals, 8%; and other, 8%.

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

(Metric tons unless otherwise specified)

Commodity	1973 Sabah	1973 Sarawak	1973 West Malaysia	1973 Total	1974 Sarawak	1974 West Malaysia	1974 Total [2]
METALS							
Aluminum:							
Bauxite	--	--	1,018,957	1,018,975	--	814,956	814,956
Alumina	--	--	1	1	--	(3)	(3)
Metal including alloys:							
Scrap	27	35	485	547	139	714	853
Unwrought	--	--	177	177	--	31	31
Semimanufactures	1	(3)	1,594	1,595	(3)	1,199	1,199
Columbite ore	--	--	69	69	575	160	735
Copper:							
Ore	--	--	(3)	(3)	--	--	--
Metal:							
Scrap	137	114	1,128	1,379	74	1,140	1,214
Unwrought and semimanufactures	(3)	(3)	r 851	r 851	(3)	631	631
Iron and steel:							
Iron ore ... thousand tons	--	--	224	224	--	176	176
Metal:							
Scrap	3,901	1,238	842	5,981	2,354	1,099	3,453
Pig iron, ferroalloys and similar materials	(3)	--	117	117	--	130	130
Steel, primary forms	--	2	1,772	1,774	--	710	710
Semimanufactures:							
Bars, rods, angles, shapes, sections	25	44	34,407	34,476	590	31,651	32,241
Universals, plates, sheets	61	14	11,449	11,524	7,356	21,416	28,772
Hoop and strip	--	--	413	413	545	1,083	1,628
Rails and accessories	435	196	797	1,428	823	1,118	1,941
Wire	(3)	12	4,168	4,180	2,420	3,753	6,173
Tubes, pipes, fittings	64	217	8,440	8,721	5,565	10,169	15,734
Castings and forgings, rough	168	(3)	206	374	362	758	1,120
Lead:							
Oxide	--	--	25	25	25	33	58
Metal including alloys, all forms	45	33	193	271	105	86	191
Magnesium metal including alloys, all forms	--	--	--	--	--	(3)	(3)
Manganese ore	--	--	62,574	62,574	--	107,663	107,663
Mercury ... 76-pound flasks	--	--	1	1	1	4	5
Nickel metal including alloys, all forms	--	--	1,290	1,290	--	188	188
Platinum-group metals and silver:							
Platinum group ... troy ounces	--	--	29	29	--	--	--
Silver ... do	--	--	3,077	3,077	--	44	44
Rare-earth metals, monazite	--	--	2,541	2,541	--	1,724	1,724
Thorium ore	--	--	125	125	--	103	103
Tin:							
Metal including alloys:							
Scrap	--	--	13	13	--	1	1
Residues (slag and hardhead)	--	--	11,382	r 11,382	--	9,330	9,330

Unwrought	--	(3)	r 81,544	r 81,544	--	85,734	85,734
Semimanufactures	--	--	1	1	--	19	19
Titanium ore and concentrate:							
Ilmenite	--	--	185,414	185,414	--	153,531	153,531
Other	--	--	241	241	--	153	153
Tungsten ore and concentrate	--	--	337	337	--	375	375
Zinc metal including alloys:							
Oxide	--	--	261	261	--	458	458
Scrap	--	--	180	180	1	152	153
Blue powder	--	--	18	18	--	1	1
Unwrought	--	--	19	19	--	127	127
Semimanufactures	3	(3)	35	38	--	162	162
Zircon	--	--	3,142	3,142	--	20,036	20,036
Other:							
Ores and concentrates	--	777	10	787	575	10	585
Ash and residue containing nonferrous metals	--	--	512	512	--	1,027	1,027
Oxides, hydroxides, peroxides of metals, n.e.s	--	--	r 135	r 135	--	274	274
Metals including alloys, all forms	--	--	7	7	--	(3)	(3)
NONMETALS							
Abrasives, natural, n.e.s.:							
Pumice, emery, natural corundum, etc	--	--	13	13	--	2	2
Grinding and polishing wheels and stones	(3)	--	47	47	2	105	107
Asbestos	--	--	4	4	--	3	3
Barite and witherite	1,147	8	7	1,162	--	3,537	3,537
Boron materials, crude	--	--	23	23	--	4	4
Cement	49	34	97,324	97,407	735	40,232	40,967
Chalk	--	--	5	5	--	13	13
Clays and clay products (including all refractory brick):							
Crude:							
Kaolin	--	--	9,848	9,848	--	14,618	14,618
Bentonite	--	--	(3)	(3)	--	5	5
Fuller's earth	--	--	149	149	--	7	7
Other clays	--	(3)	4,583	4,583	--	625	625
Products:							
Refractory	--	5	396	401	17	2,925	2,942
Nonrefractory	--	128	7,693	7,821	118	10,086	10,204
Diamond, gem not set or strung ---value	--	--	$148,279	$148,279	--	--	--
Diatomite and other infusorial earth	--	--	8	8	--	2	2
Feldspar, fluorspar, etc	--	--	39	39	--	107	107
Fertilizer materials:							
Crude, phosphatic	--	--	3,484	3,484	--	3,988	3,988
Manufactured:							
Nitrogenous	--	--	2,470	2,470	414	6,725	7,139
Phosphatic	--	--	97	97	--	137	137
Potassic	--	2	16	18	--	113	113
Other, including mixed	--	4	31,916	31,920	153	19,858	20,011
Ammonia	--	--	298	298	--	280	280
Graphite	--	--	1	1	--	1	1
Gypsum and plasters	--	(3)	160	160	--	262	262
Lime	--	1	5,223	5,224	5	6,818	6,823
Magnesite	--	--	--	--	--	520	520

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973 Sabah	1973 Sarawak	1973 West Malaysia	1973 Total	1974 Sarawak	1974 West Malaysia	1974 Total [2]
NONMETALS—Continued							
Mica, including splittings and waste	--	--	(3)	(3)	--	--	--
Pigments, mineral, natural crude	--	(3)	9	9	--	9	9
Precious and semiprecious stones except diamond ....value	$4,277	--	$7,089	$11,366	--	--	--
Salt and brine	561	(3)	313	874	179	461	640
Sodium and potassium compounds, n.e.s.:							
Caustic soda	18	--	182	200	--	415	415
Caustic potash, sodic and potassic peroxides	--	--	8	8	(3)	36	36
Stone, sand and gravel:							
Dimension stone:							
Dolomite, chiefly refractory grade	--	--	4,408	4,408	--	3,115	3,115
Crude and partly worked	--	(3)	822	822	(3)	272	272
Worked	--	--	720	720	(3)	339	339
Gravel and crushed rock	102	30,228	721,512	751,842	38,874	852,473	891,347
Limestone, except dimension	--	--	42,742	42,742	--	47,465	47,465
Quartz and quartzite	--	--	414	414	—	123	123
Sand excluding metal bearing	--	1,712	23,528	25,240	264	33,194	33,458
Sulfur:							
Sulfuric acid	(3)	--	5 77	r 77	--	88	88
Elemental	--	--	139	139	--	10	10
Talc, steatite, soapstone, pyrophyllite	--	--	410	410	--	387	387
Other nonmetals, n.e.s.:							
Crude	--	--	263	263	(3)	291	291
Oxides, hydroxides, peroxides of barium, magnesium and strontium	--	--	r 17	r 17	--	1	1
Slag, dross and similar waste, not metal bearing	--	--	1	1	--	38	38
Building materials of asphalt, asbestos and fiber cement, including unfired clay brick	1	(3)	24,803	24,804	44	24,702	24,746
MINERAL FUELS AND RELATED MATERIALS							
Asphalt and bitumen, natural	(3)	(3)	2,848	2,848	--	33	33
Carbon black and gas carbon	--	--	23	23	--	34	34
Coal and coal briquets	--	--	38	38	--	10	10
Coke and semicoke	--	--	158	158	--	378	378
Hydrogen, helium, rare gases ....value	$4,550	--	$43,890	$48,440	$5,262	$68,462	$73,724
Petroleum:							
Crude ....thousand 42-gallon barrels	--	25,823	r (3)	r 25,823	20,720	(3)	20,720
Partly refined ....do	--	7,430	215	7,645	6,971	137	7,108
Refinery products:							
Gasoline ....do	137	461	313	911	174	83	257
Jet fuel ....do	r 61	1	35	r 97	--	(3)	(3)
Kerosine ....do	3	2,405	257	2,665	1,107	59	1,166
Distillate fuel oil ....do	15	1,610	610	2,235	1,345	324	1,669
Residual fuel oil ....do	1	(3)	41	42	--	11	11
Lubricants ....do	1	(3)	215	216	12	242	254

Other:							
Mineral jelly and wax ---do---	(3)	2	(3)	r 2	--	(3)	(3)
White spirit ---do---	--	--	2	2	--	2	2
Nonlubricating oils, n.e.s ---do---	(3)	--	12	12	(3)	6	6
Bitumen and bituminous mixtures, n.e.s ---do---	(3)	(3)	22	22	--	26	26
Liquefied petroleum gas ---value---	$3,613	$49	$119,873	$123,535	$2,004	$127,232	$129,236
Unspecified ---thousand 42-gallon barrels---	--	4,504	2	4,506	2,420	(3)	2,420
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ---	--	9	6,833	6,842	5	271	276

r Revised.
1 Figures for each region include exports to each of the other regions of Malaysia.
2 Excludes Sabah.
3 Less than ½ unit.

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

(Metric tons unless otherwise specified)

Commodity	1973 Sabah	1973 Sarawak	1973 West Malaysia	1973 Total	1974 Sarawak	1974 West Malaysia	1974 Total [2]
METALS							
Aluminum:							
Bauxite	--	--	300	300	--	500	500
Oxide and hydroxide	--	(3)	4,447	4,447	(3)	4,089	4,089
Metal including alloys, all forms	196	262	11,707	13,965	404	18,802	19,206
Antimony metal	(3)	1	17	18	1	31	32
Arsenic trioxide, pentoxide, acid	--	--	3,818	3,818	--	5,305	5,305
Chrome, oxide and hydroxide	(3)	(3)	76	76	(3)	77	77
Cobalt, oxide and hydroxide	--	--	1	1	1	1	2
Columbium and tantalum, ore and concentrate	--	--	--	--	--	32	32
Copper:							
Ore and concentrate	(3)	(3)	14	14	--	12	12
Metal including alloys, all forms	278	101	5,882	6,261	78	6,981	7,059
Iron and steel:							
Ore and concentrate	--	(3)	13,766	13,766	--	(3)	(3)
Iron and steel scrap	47	198	4,685	4,930	236	10,397	10,633
Pig iron, including cast	11	558	8,294	8,863	10	7,462	7,472
Sponge iron, powder and shot	(3)	(3)	r 193	r 193	(3)	379	379
Ferroalloys:							
Ferromanganese	--	--	2,409	2,409	1	3,299	3,300
Other	(3)	--	2,269	2,269	1	1,518	1,519
Steel, primary forms	2,351	147	47,261	49,759	616	43,911	44,527
Semimanufactures:							
Bars, rods, angles, shapes, sections	26,336	24,276	r 127,601	r 178,214	27,695	231,025	258,720
Universals, plates, sheets	12,705	9,166	288,455	310,326	9,659	328,092	337,751
Hope and strip	346	469	41,112	41,927	545	46,920	47,465
Rails and accessories	337	2,116	4,616	7,069	823	10,414	11,237
Wire	2,867	5,141	55,894	63,902	2,420	37,661	40,081
Tubes, pipes and fittings	25,791	5,449	r 21,774	r 53,014	5,565	14,511	20,076
Castings and forgings, rough	314	227	770	1,311	362	1,660	2,022
Lead:							
Ore and concentrate	--	--	143	143	--	53	53
Oxides	339	(3)	839	1,178	26	1,048	2,074
Metal including alloys, all forms	1	21	2,799	2,821	20	3,923	3,943
Magnesium metal including alloys, all forms	(3)	(3)	4	4	(3)	5	5
Manganese:							
Ore and concentrate	(3)	(3)	834	834	--	1,179	1,179
Oxides	1	(3)	521	522	3	542	545
Mercury ... 76-pound flasks	--	(3)	70	70	7	135	142
Molybdenum, metal	--	--	14	14	--	56	56
Nickel metal including alloys, all forms	(3)	(3)	r 648	r 648	(3)	501	501
Platinum-group metals including alloys ... troy ounces	2	78	2,785	2,865	175	1,050	1,225
Silver ... do	729	9,713	3,573	14,015	395	39,652	40,047
Tantalum metal, all forms	--	--	16	16	--	6	6

Tin:							
Ore	--	--	r 15,160	r 15,160	(3)	21,518	21,518
Slag and hardhead	--	--	r 2,100	r 2,100	--	700	700
Metal including alloys, all forms	21	52	175	248	27	338	365
Titanium:							
Ore and concentrate	--	--	145	145	(3)	136	136
Oxides	--	(3)	2,693	2,693	(3)	2,826	2,826
Tungsten, ore and concentrate, gross weight	--	(3)	r 81	r 81	--	105	105
Zinc:							
Ore	(3)	(3)	6,185	6,185	--	2,409	2,409
Oxide	339	1	146	486	(3)	169	169
Blue powder	--	--	68	68	--	109	109
Metal including alloys, all forms	21	96	r 4,220	r 4,337	42	8,447	8,489
Zirconium, ore and concentrate	--	--	72	72	(3)	492	492
Other:							
Ore and concentrate	--	47	2	49	47	177	224
Ash and residue containing nonferrous metals	--	102	526	628	168	342	510
Oxides, n.e.s	--	--	2	2	--	8	8
Metals including alloys, all forms	2	(3)	2	4	(3)	6	6
NONMETALS							
Abrasives, natural, n.e.s.:							
Pumice, emery, etc	(3)	1	172	173	(3)	238	238
Dust and powder of precious and semiprecious stones __value__	$46	--	r $202	r $248	$54,569	--	$54,569
Grinding and polishing wheels and stones	35	27	910	972	34	934	968
Asbestos	28	3	15,199	15,230	2	19,207	19,209
Barite and witherite	1,454	--	184	1,638	3,039	193	3,232
Boron materials:							
Crude natural borates	61	1,212	r 162	r 1,435	(3)	65	65
Oxides and acids	1	(3)	100	101	(3)	88	88
Cement	111,551	98,919	20,710	231,180	95,094	39,651	134,745
Chalk	1	--	434	435	(3)	363	363
Clays and clay products:							
Crude:							
Bentonite	229	1	414	644	438	552	990
Kaolin	5	16	1,099	1,120	3	1,457	1,460
Fuller's earth	18	8	2,521	2,547	6	3,488	3,494
Mullite, chamotte, dinas earth	--	--	128	128	--	119	119
Other	61	76	4,260	4,397	--	7,028	7,028
Products:							
Refractory	171	190	9,517	9,878	117	13,941	14,058
Nonrefractory	2,092	1,735	r 7,241	r 11,068	1,833	7,689	9,522
Cryolite and chiolite	--	--	99	99	--	(3)	(3)
Diamond:							
Gem, not set or strung __value, thousands__	--	$2	$2,258	$2,260	--	$2,360	$2,360
Industrial __do__	--	--	$16	$16	--	$17	$17
Diatomite and other infusorial earth	(3)	(3)	256	256	--	307	307
Feldspar	--	--	r 5,914	r 5,914	--	6,763	6,763
Fertilizer materials:							
Crude:							
Nitrogenous	--	--	6	6	2	21	23
Phosphatic	246	5,530	145,011	150,787	2,674	134,082	136,756
Potassic	520	173	305	998	473	137	610

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973 Sabah	1973 Sarawak	1973 West Malaysia	1973 Total	1974 Sarawak	1974 West Malaysia	1974 Total[2]
NONMETALS—Continued							
Fertilizer materials—Continued							
Manufactured:							
Nitrogenous	3,385	4,993	r 100,631	r 109,009	1,391	151,803	153,194
Phosphatic:							
Thomas slag	--	14	115	129	51	101	152
Other	1,521	242	13,094	14,857	155	8,685	8,840
Potassic	4,865	934	145,083	150,882	3,007	164,667	167,674
Other, including mixed	7,196	18,046	65,834	91,076	2,782	66,508	69,290
Ammonia	296	13	841	1,150	288	33,416	33,704
Fluorspar, leucite, etc	13	--	4,991	5,004	--	7,458	7,458
Graphite, natural	(3)	(3)	297	297	--	365	365
Gypsum and plasters	20	15	32,223	32,258	7	54,940	54,947
Lime	1,366	275	2,154	3,795	245	2,244	2,489
Magnesite	2	30	319	351	352	270	622
Mica, worked and unworked, including waste	--	--	r 62	r 62	(3)	33	33
Pigments, mineral:							
Natural crude	1	--	210	211	2	565	567
Iron oxides	6	3	967	976	21	1,271	1,292
Precious and semiprecious stones, except diamond:							
Natural ... value	$27	$3,819	r $104,066	r $107,912	$1,775	$187,803	$189,578
Manufactured ... do	$34	--	r $12,483	r $12,517	--	$9,926	$9,926
Pyrite	--	(3)	69	69	--	--	--
Salt and brine	4,363	7,024	84,620	96,007	8,538	73,167	81,705
Sodium and potassium compounds,							
Caustic soda	48	239	10,219	10,506	205	11,686	11,891
Caustic potash, sodic and potassic peroxides, natron	7	8	r 19,739	r 19,754	37	29,350	29,387
Stone, sand and gravel:							
Dimension stone, crude and worked	51	144	r 2,051	r 2,246	309	2,307	2,616
Dolomite, chiefly refractory grade	--	383	251	634	259	309	568
Gravel and crushed rock	5,393	538	1,181	7,112	787	2,256	3,043
Limestone (except dimension)	398	121	828	1,347	29	950	979
Quartz and quartzite	--	--	9	9	--	28	28
Sand excluding metal bearing	179	20	542	741	2	1,422	1,424
Sulfur:							
Elemental	13	1	r 13,957	r 13,957	(3)	17,716	17,716
Sulfur dioxide	(3)	(3)	8	8	--	11	11
Sulfuric acid	107	54	55	216	85	358	443
Talc, steatite, soapstone, pyrophyllite	125	64	r 4,338	r 4,503	150	4,241	4,391
Other nonmetals, n.e.s.:							
Crude	10	1,212	r 35,097	r 36,319	846	39,634	40,480
Slag, dross and similar waste, nonmetal bearing	3	--	r 254	r 257	5	249	254
Oxides and hydroxides of magnesium, barium, strontium	1	30	r 34	r 65	1	130	131

MINERAL FUELS AND RELATED MATERIALS							
Asphalt and bitumen, natural	2,639	150	1,526	4,315	1,628	720	2,348
Carbon black	80	5	8,380	8,465	1	10,176	10,177
Coal, coke and briquets:							
Anthracite and bituminous coal and briquets	(3)	1	13,342	13,343	--	19,020	19,020
Lignite and lignite briquets	102	--	--	102	10	5	15
Coke and semicoke	17	95	38,813	38,925	122	46,079	46,201
Oxygen, hydrogen, nitrogen, rare gases ... value	$168,528	$82,378	r $227,825	r $478,731	$248,679	$204,737	$453,416
Peat	39	--	8	47	--	--	--
Petroleum:							
Crude ... thousand 42-gallon barrels	--	6,725	20,627	27,352	2,840	21,248	24,088
Partly refined ... do	--	1,652	r 754	r 2,406	2,418	75	2,493
Refinery products:							
Gasoline ... do	735	303	1,043	2,081	40	1,446	1,486
Jet fuel ... do	146	127	534	807	64	629	693
Kerosine ... do	179	117	525	821	197	655	852
Distillate fuel oil ... do	1,163	303	5,179	6,645	196	5,782	5,978
Residual fuel oil ... do	219	68	1,264	1,551	120	1,021	1,141
Lubricants ... do	62	60	662	784	46	661	707
Other:							
White spirits ... do	1	(3)	97	98	1	44	45
Mineral jelly and wax ... do	(3)	(3)	53	53	1	48	49
Nonlubricating oil ... do	17	1	85	103	2	63	65
Petroleum coke ... do	--	--	58	58	--	95	95
Bitumen and other residues ... do	43	38	104	185	5	79	84
Liquefied petroleum gas ... value, thousands	$379	$318	r $2,317	r $3,014	$1,256	$5,929	$7,185
Not specified ... thousand 42-gallon barrels	(3)	(3)	r 8	r 8	(3)	2	2
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	51	146	1,876	2,073	109	1,622	1,731

r Revised.
1 Figures for each region include imports to each of the other regions of Malaysia.
2 Excludes Sabah.
3 Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—Three mines in the State of Johore in Peninsular Malaysia accounted for the total production of 703,561 tons of bauxite in 1975. Output of bauxite was down 26% due to lower grade ore and lack of export demand. As in previous years, most of Malaysia's bauxite production was shipped to Japan.

Copper.—In May 1975, the Overseas Mineral Resources Development (OMRD) Sabah Bhd, a joint venture between OMRD Tokyo (51%) and Malaysian interests (49%) began test production at the Sabah mine, located in northwest Sabah, about 65 kilometers east of Kota Kinabalu.[4] The ore body was estimated to contain 80 million to 100 million tons of copper ore. The total annual output was to be shipped to Japan, and the ore and concentrates would be allocated to the smelters according to the investment ratio by the seven Japanese companies which comprise OMRD Tokyo. About $93 million has been spent on the project since 1973 to cover development costs of the mine and construction of port facilities, roads, and other infrastructure. The bulk of the funds was from the Japan Export-Import Bank and the Japan International Cooperation Agency.

Commercial production from Mamut was rescheduled for late 1975. Technical problems associated with heavy perennial rainfall delayed initial production, due to the difficulty of separating mud from the porphyry ore. By yearend, 7,000 tons of copper concentrate was ready for shipment to Japan.

Iron Ore.—Output of iron ore has declined annually since the late 1960's; production in 1975 was 348,200 tons compared with 5,234,000 tons in 1969. Mine production was from Perak, Johore, Kedah, and Pahang States, with Pahang producing about one-half of the total output. Most of the iron ore and concentrate was exported to Japan.

Tin.—Mine output (metal content) and smelter output declined 6% and 2%, respectively, in 1975 primarily because of export controls. However, Malaysia remained the world's largest producer of tin-in-concentrate and refined metal, as well as the world's largest exporter of tin. At yearend, there were 55 tin dredges, 810 gravel pump mines, and 45 opencast, underground, and unspecified mines in operation. Production of tin metal by the Butterworth and Penang smelter totaled 78,978 tons.

Production of tin-in-concentrate by type of operation was as follows: Gravel pump, 55%; dredging, 32%; opencast, 4%; underground, 3%; and other sources, not identified, 6%. Between May 1 and yearend, export controls and low prices forced the closure of 94 marginal gravel pump mines. However, the Government established a hardship quota pool to assist producing mines during the period of imposed export restrictions. Additional production was allowed for some mines to permit higher output, thereby reducing operating costs.

Berjuntai Tin Dredging Bhd. (Berjuntai) was the largest tin producing company in Malaysia. Berjuntai operated seven dredges at extensive mining leases in Kuala Selangor and accounted for about 6% of the total output of tin-in-concentrate. Dredge No. 8 was being constructed at a cost of about $7 million and was to replace Berjuntai's No. 1 dredge when placed in operation in mid-1976.

London Tin Corp., Ltd. was the world's largest tin investment group and the largest holder of Malaysian tin mines. London Tin had 38 alluvial dredges operating under the management of Anglo Oriental (Malaysia) Sdn. Bhd., of which 32 dredges were stationed in Malaysia. Through a series of proposed stock transactions, Pernas Securities, a subsidiary of Perbadanan Nasional Bhd., was to acquire 39.7% of the share capital of Har Par Brothers International. In turn, Har Par would gain 50.35% of the issued capital of London Tin. While the takeover offer had been approved in principle, final consent had not been received from the Exchange Control and Revenue Authority.

In 1975, other producers of tin concentrates in Malaysia included Kamunting which had dredging operations near Taiping; Malayan Tin near Kampong Gajah in Perak; Southern Kinta Consolidated, Ltd. at the Rasa Section in Selangor; Southern Malayan Tin in Kinta and Batang

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[4] Mining Magazine. V. 132, No. 4, April 1975, p. 252.

Padang; Kinta Kellas, Pengkalen, and Tanjong Tin, each operating in the Kinta Valley region of Perak; Petaling Tin Bhd. in southwest Selangor; Tronoh Mines Ltd. in Perak; and Ayer Hitam in Selangor. In addition, Sungei Besi had opencast mining operations approximately 10 miles south of Kuala Lumpur; Idris Hydraulic had opencast and gravel pumping operations in Ipoh; and Pahang Consolidated operated the only underground lode mine in Malaysia in Pahang on the east coast of Peninsular Malaysia.

Titanium.—Production of ilmenite concentrate, all from West Malaysia, totaled 112,248 tons and was derived principally from tailings of dredging operations. The bulk of the ilmenite produced was exported to Japan. Currently, a synthetic rutile plant utilizing ilmenite as feed material was in operation in Lahat near Ipoh for the production of titania pigment. Sakai Trading Co., Klöckner Werke A.G., and Malaysian interests were reportedly forming a company to develop ilmenite occurrences in northeast Malaysia. Malaysian Titanium Corp., composed of Straits Trading Co., Ltd. (30%), and Malaysian interests (70%), announced the construction of a 50,000-ton-per-year synthetic rutile plant near Ipoh, Perak State. Ilmenite, available from tin tailings, would be upgraded to a synthetic rutile for the production of titania. Trial operations were planned for 1976.

Other Metals.—During the year, about 250 tons of antimony ore was mined in Sarawak. Output of gold was around 3,700 troy ounces; close to 70% was from mine output in West Malaysia, and the remaining 30% from Sarawak. Mine output of tungsten was 194 tons. Recovery of metals from tailings of dredging operations were as follows, in tons: Columbite, 50; monazite, 3,285; wolfram, 194; and xenotime, 53. Output of manganese ore was up 64% and totaled 133,308 tons in 1975.

NONMETALS

Cement.—Production of cement in 1975 was about 1.5 million tons. Total output was by five firms with seven plants. Associated Pan Malaysian Cement Sdn. Berhad, with a total capacity of 750,000 tons per year, has plants in Chemor, Perak, and Rawang. Tasek Cement, Ltd., has a 520,000-ton-per-year capacity plant at Ipoh. Malaya Industrial and Mining Corp. Berhad operated a 60,000-ton-per-year plant at Batu Caves, Selangor. In late 1974, Cement Industries of Malaysia Sdn. Berhad completed construction of its 400,000-ton-per-year plant and initial production began in early 1975. Construction of a cement plant with an output of 20,000 tons per month was completed in late 1975. The plant, a joint venture between the Perlis State Government and private interests, was expected to be in full production in 1976.

Fertilizer Materials.—Total production of crude and manufactured fertilizers in 1975 was estimated at 246,000 tons, compared with domestic consumption of 675,000 tons. To meet domestic requirements, about 400,000 tons of potassium fertilizers; urea; composite, complex, and compound fertilizers; and natural phosphate were imported during 1975 from Canada, the Christmas Islands, West Germany, Japan, and the United States. Petronas formulated plans to set up a nitrogeneous fertilizer plant to serve domestic needs and the area market. An ammonia-urea plant, planned for startup in 1981, would make use of local natural gas as feedstock.

MINERAL FUELS

Natural Gas.—As a result of the increase in crude oil production, output of associated natural gas was estimated at 96 billion cubic feet per day in 1975. While nonassociated natural gasfields have been discovered offshore Sarawak and on Peninsular Malaysia, no commercial production has occurred. Petronas was negotiating with undisclosed parties to build and operate a plant to liquefy natural gas from Central Luconia Province in Sarawak. A plant to be constructed in Bintulu by 1981 would have a capacity of 6.4 million tons per year of liquefied natural gas (LNG). Petronas estimated that gas reserves were sufficient to feed the plant for 20 years. The LNG produced would be exported probably to Japan.

Petroleum.—The production of crude oil in 1975 increased 21% over that of 1974 to average about 98,000 barrels per day. The entire output of crude came from offshore fields in Sabah and Sarawak. Commercial oil deposits have been discovered off Peninsular Malaysia. Production from these fields has not commenced because negotiations were still in progress between Petronas and Esso on a production-sharing agreement.

The biggest single producing company in Malaysia was Sarawak Shell which operated offshore fields in West Lutong and Baram, close to the rich deposits of Brunei. Sarawak Shell produced close to 75% of the country's total output of crude oil. The bulk of the remainder was produced by Sabah Shell from three platforms in the Samarang Field off the southwestern coast of Sabah. Esso produced only between 3,000 to 5,000 barrels per day from the Tembungo Field off Sabah. Construction of Esso's two offshore platforms in the Tembungo concession was halted in May 1975 pending the outcome of Esso's negotiation of production arrangements with Petronas.

Only about 20% of the total crude oil production was locally consumed; the rest was exported. Malaysia's oilfields produce low-sulfur light crude which commands a higher price compared with the heavier West Asia crude, which is imported for refining. Moreover, the yield of local crude does not fit the domestic demand, particularly for kerosine. Additionally, Malaysian refineries were designated basically to use heavy crude as a feedstock.

In 1975, the intake of crude oil by the three refineries in Malaysia (two at Port Dickson in Peninsular Malaysia and one at Lutong in Sarawak) averaged about 83,200 barrels per day. The Shell and Esso refineries at Port Dickson had capacities to process 90,000 and 35,500 barrels per day, respectively, while the Shell refinery at Lutong had a 40,000-barrel-per-day capacity. The total output of finished petroleum was estimated at 80,100 barrels per day in 1975 by the three Malaysian refineries.

The Mineral Industry of Mexico

By Roland W. Merwin [1]

Mexico's gross domestic product (GDP) at current prices was $78,690 million,[2] an increase of 21% over that of 1974, with the increase being largely accounted for by an inflation rate of 16% in 1975. The mining sector contributed 0.8% in 1975 as compared with 1.0% in 1974 while the petroleum sector accounted for 4.8% in 1975 as compared with 4.5% in 1974.

The mining and petroleum sectors were key elements in efforts by the Mexican Government to industrialize its economy and were receiving priority consideration by government planning organizations. There was a continuing trend toward complete government ownership or control of the mineral extractive industries, as well as greater government participation in the industrial sectors utilizing minerals and fuels for the manufacture of finished products.

Late in 1975 the Government formally approved a new mining law which in effect fundamentally changed the mining law of 1961 as it related to nonfuel minerals. The basic intent of the new law was to give the Government an even greater control over mining activities in Mexico. One section of the law provides a legal basis for the establishment of government-owned firms to carry on large-scale mining exploration and development programs. Another section gives the Government virtually an exclusive right in exploration and exploitation of phosphate, potassium, sulfur, iron ore, and coal with the provision that this exclusive right could be expanded upon by the Ministry of National Patrimony. The Government was also authorized to take over unworked mining concessions and operate them directly or assign their development to other companies within the industry. Additionally, concessions would no longer be issued on an indefinite basis but would be subject to future periodic renewals.

The new law came in for immediate criticism from private mining companies in Mexico. One objection was that the reforms could eventually result in a complete phasing out of private sector participation in the mining industries as well as tend to limit short-term private investment interest in mining. It was also claimed that the reforms contained retroactive clauses that could greatly affect operations of presently active privately owned companies including those which are 100% Mexicanized as concerns full equity capital and administration.

Notwithstanding the objections from the private sector, the reforms were strongly supported by government agencies, which stated that the reforms would put an end to the problem of unworked or abandoned mining concessions and would also promote a full pledged program of national exploration for new mineral deposits. These programs would be financed primarily by the Government or its specialized agencies such as the Mining Development Commission and the Council of Non-Renewable Resources. It was also maintained that the reform would promote much greater activity by small miners who could under certain circumstances be exempt from many of the regulations cov-

[1] Supervisory physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from Mexican pesos (Mex$), to U.S. dollars at the rate of Mex$1 = US$0.08.

ering exploitation and development programs which the major mining companies would be subject to under the new reforms.

The new mining law was expected to lead to an increasing participation by the Government in mining activity in Mexico either on a direct investment basis or by joint ventures with national and/or foreign investors from the private sector. This participation has been definitely increasing in recent years. In 1970 mining companies with a strong government equity position accounted for approximately 15% of national mining production, but by 1975 their production had increased to about 35%.

PRODUCTION

Mexico's mining industry, exclusive of construction materials, is largely based on the production of copper, lead, zinc, silver, fluorspar, and sulfur.

After 2 years of sustained growth both the metallic and nonmetallic sectors of the mining industry were adversely affected by depressed world demand. With the exception of a few individual commodities, production decreased in both quantity and value as compared with 1974. On the basis of preliminary data covering 18 metallic and 21 nonmetallic minerals it was estimated that the production value of Mexico's mining industry decreased by 8% from $1,053 million in 1974 to $968 million in 1975.

In contrast to the mining industry, Mexico's petroleum industry registered strong gains in both production and value of sales. Crude petroleum production increased 262 million barrels in 1975 as compared with 210 million barrels in 1974, an increase of 25%. The value of sales, including exports, increased by 21% from $2,328 million in 1974 to $2,806 million in 1975.

Data on mineral production are shown in table 1.

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

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum, primary	[r] 39,160	41,144	39,914
Antimony:			
Mine output, metal content	2,388	2,407	3,137
Metal (in mixed bars)	903	871	NA
Arsenic, white [2]	5,086	9,505	6,121
Bismuth, content of exported concentrates, bullion and refined metal	585	718	445
Cadmium:			
Mine output, metal content	1,477	1,960	1,581
Metal, refined	182	527	586
Copper:			
Mine output, metal content	80,501	82,670	78,196
Electrolytic solution [3]	4	--	--
Metal:			
Blister	73,034	78,310	76,374
Refined	57,212	68,201	63,149
Gold:			
Mine output, metal content troy ounces	132,557	134,454	144,710
Metal, refined do	123,201	127,285	132,236
Iron and steel:			
Iron ore:			
Gross weight [4] thousand tons	[r] 4,670	5,007	4,897
Metal content do	3,113	3,338	3,265
Pig iron and sponge iron do	2,775	3,206	2,961
Ferroalloys do	82	81	86
Crude steel do	4,760	5,138	5,250
Steel semimanufactures do	3,602	4,188	4,135
Lead:			
Mine output, metal content	179,296	218,021	178,615
Smelter (in refined and mixed bars)	172,929	200,180	172,928
Manganese ore:			
Gross weight [5]	364,025	403,134	428,459
Metal content	131,049	145,128	154,245
Mercury, mine output, metal content 76-pound flasks	20,306	25,933	18,652
Molybdenum, mine output, metal content	41	43	17
Nickel, mine output, metal content	32	25	50

See footnotes at end of table.

Table 1.—Mexico: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS—Continued			
Selenium, metallic	39	50	58
Silver:			
Mine output, metal content thousand troy ounces	38,788	37,546	38,029
Metallurgical products, metal content do	37,394	34,987	36,598
Tin:			
Mine ouptut, metal content	292	400	378
Smelter, primary [e] [6]	960	1,200	1,000
Tungsten, mine output, metal content	348	309	277
Zinc:			
Mine output, metal content	271,373	262,716	228,851
Smelter, primary	71,423	136,887	149,023
NONMETALS			
Asbestos	15	5	26
Barite	255,257	271,710	299,985
Cement, hydraulic thousand tons	9,787	10,595	11,612
Clays:			
Bentonite	45,793	61,185	32,507
Fuller's earth	50,303	53,861	38,197
Kaolin	94,364	93,372	120,440
Refractory	141,263	138,353	106,336
Diatomite	19,559	23,630	22,723
Feldspar	97,107	185,304	143,808
Fertilizer materials:			
Crude, phosphate rock	71,542	194,095	282,480
Manufactured:			
Nitrogenous, gross weight thousand tons	971	994	1,068
Phosphatic, gross weight do	485	505	523
Mixed, gross weight do	370	338	[e] 390
Fluorspar, all grades do	1,086	1,112	1,089
Graphite, all grades	65,392	62,551	60,814
Gypsum and anhydrite, crude thousand tons	1,514	1,387	1,256
Magnesite	28,725	22,126	39,523
Mica, all grades	782	844	620
Perlite	13,479	12,136	19,066
Salt, all types thousand tons	4,319	5,508	[e] 6,000
Stone, sand and gravel:			
Calcite, common	4,378	5,504	7,634
Dolomite	410,120	426,717	343,719
Limestone [7] thousand tons	3,419	3,456	4,652
Marble	3,767	5,694	2,693
Quartz, quartzite, glass sand	411,432	513,984	518,973
Cobblestone	4,833	5,081	NA
Strontium minerals	18,273	29,545	14,722
Sulfur, elemental:			
Frasch process thousand tons	1,544	2,257	2,074
Byproduct from natural gas do	64	65	90
Total do	1,608	2,322	2,164
Sulfates, natural sodium	173,991	148,271	300,121
Talc and related materials, talc	2,108	2,649	1,480
Wollastonite	1,593	1,984	543
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [e]	33,500	34,000	36,000
Coal, bituminous thousand tons	4,263	5,166	5,193
Coke:			
Metallurgical do	1,904	2,034	2,058
Imperial do	11	17	12
Breeze do	19	20	18
Total do	1,934	2,071	2,088
Gas:			
Manufactured, all types	[r] 186,776	211,751	[e] 212,000
Natural:			
Gross production million cubic feet	676,750	744,673	786,458
Marketable production do	541,772	560,911	583,876
Natural gas liquids:			
Field condensate thousand 42-gallon barrels	28	29	50
Other do	26,573	28,416	32,665
Petroleum:			
Crude do	164,881	209,826	261,540

See footnotes at end of table.

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

Commodity [1]	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products:			
Aviation gasoline ----- thousand 42-gallon barrels --	457	409	522
Other gasoline ---- do ----	58,155	64,922	66,504
Jet fuel ---- do ----	4,445	5,734	5,275
Kerosine ---- do ----	12,366	12,882	12,966
Distillate fuel oil ---- do ----	38,274	50,226	55,376
Residual fuel oil ---- do ----	54,743	62,296	65,441
Lubricants ---- do ----	2,367	2,759	3,024
Other:			
Liquefied petroleum gas ---- do ----	17,178	18,439	18,819
Asphalt ---- do ----	7,686	4,725	4,115
Unspecified ---- do ----	4,744	4,653	4,555
Refinery fuel and losses ---- do ----	10,373	13,411	11,380
Total ---- do ----	210,788	240,456	247,977

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 from reported iron content based on grade 66.67% iron.
[5] Calculated on the basis of ore containing 36% manganese, from reported metal content of mine production.
[6] Estimate by the International Tin Council.
[7] Excluding that for cement production.

TRADE

The principal nonfuel mineral exports by value were blister copper, zinc concentrates and metal, lead metal, refined silver, metallurgical- and acid-grade fluorspar, and crude sulfur. As in the past, the principal destinations of these exports were to the United States.

Because of lower world prices, the export value of nonfuel minerals was substantially below that of 1974. Based on preliminary statistics, the value of metallic and nonmetallic mineral exports in 1975 amounted to only $434 million as compared with $529 million in 1974, a decrease of 18%.

Mexico became a net exporter of petroleum and petroleum products for the first time since 1969. The export value of these products was $465 million in 1975 as compared with imports of $278 million for a favorable balance of trade of $187 million. By contrast, exports of these products in 1974 were valued at only $124 million against imports of $351 million for a trade deficit of $227 million.

Available data on mineral exports and imports are shown in tables 2 and 3.

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

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Oxide (alumina) ----	25	6	All to Costa Rica.
Metal including alloys, all forms ----	822	1,378	Chile 481; Colombia 303; United States 137.
Antimony:			
Ore and concentrate, gross weight --	6,266	6,587	All to United States.
Metal including alloys, all forms ---	100	98	United States 76; Brazil 10.
Arsenic:			
Oxide, gross weight:			
White ----	5,269	5,328	United States 5,275.
Black ----	82	(1)	Mainly to Ecuador.
Speiss and similar materials, oxide content ----	--	72	All to United States.
Bismuth metal including alloys, all forms ----	675	838	United States 431; United Kingdom 268.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Cadmium:			
Concentrate and speiss, gross weight	23	660	All to United States.
Flue dust, metal content	253	462	Do.
Metal	151	441	Brazil 221; United States 202.
Copper:			
Ore and concentrate, gross weight	16,126	4,774	Belgium-Luxembourg 3,147; United States 1,627.
Copper sulfate	964	1,343	Brazil 1,140.
Metal including alloys:			
Scrap	2,045	--	
Unwrought and semimanufactures	28,901	14,551	United States 8,874; Japan 1,660.
Iron and steel:			
Ore and concentrate, gross weight	--	4	Mainly to United States.
Metal including alloys:			
Scrap	3,617	327	All to United States.
Ferroalloys:			
Ferrosilicomanganese	3,862	--	
Other	400	1,777	United States 1,421; Colombia 336.
Steel, primary forms	([1])	2	All to United States.
Semimanufactures	135,371	106,358	United States 81,985.
Lead:			
Ore and concentrate, gross weight	3,224	17,263	All to United States.
Oxides:			
Litharge	40,269	40,819	Italy 11,008; United States 8,324.
Red lead	2,423	3,377	United States 783; Colombia 504; Italy 475.
Metal including alloys:			
Scrap	4	--	
Unwrought:			
Antimonial and other bars	8,064	5,348	Netherlands 3,549; United States 730.
Refined	56,013	108,104	Italy 37,750; United States 22,972; Netherlands 15,297.
Semimanufactures	891	75	United States 38; Venezuela 15; Netherlands 10.
Manganese ore and concentrate, gross weight	195,863	264,695	Japan 119,041; United States 110,536; France 27,058.
Mercury ---- 76-pound flasks	21,646	29,342	United States 16,613; Brazil 3,312.
Nickel metal including alloys, all forms	3	6	Costa Rica 4.
Selenium:			
Elemental	35	20	United States 10; United Kingdom 7.
Matte, speiss, anode slimes, smelter residues	--	50	All to United States.
Silver [2] ---- thousand troy ounces	466,120	632,482	United States 623,413.
Tin metal including alloys, all forms	18	17	United States 12.
Tungsten ore and concentrate, gross weight	522	349	United States 204; West Germany 71; France 38.
Zinc:			
Ore and concentrate, gross weight	241,351	292,092	United States 122,006; Italy 42,400; Spain 40,545.
Oxide, white	9,333	11,606	United States 10,598.
Sulfate	4,672	7,351	United States 7,063.
Metal including alloys:			
Powder	924	2,105	United States 1,412; Argentina 692.
Unwrought	12,076	73,711	United States 34,882; United Kingdom 15,626.
Semimanufactures	1	348	Brazil 332.
Other nonferrous base metals:			
Ores, concentrates, metallurgical residues, except scrap	2,118	3,489	All to United States.
Metal, all forms	140	83	United States 82.
NONMETALS			
Abrasives, natural, n.e.s.:			
Emery	1	2	El Salvador 1.
Pumice	98	20	All to United States.
Asbestos	16	7	Guatemala 5.
Barite and witherite	132,565	148,351	United States 148,250.
Cement	170,400	187,679	United States 185,566.
Clays and clay products:			
Crude clays, n.e.s.:			
Bentonite	23	43	Guatemala 30; El Salvador 8.
Fuller's earth and other earth	11,586	28,039	West Germany 11,777; Brazil 4,191; Syria 4,080.
Kaolin (china clay)	259	5	All to Colombia.
Other	179	263	Peru 77; Ecuador 72; Guatemala 64.

See footnotes at end of table.

Table 2.—Mexico: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Clays and clay products—Continued			
Products:			
Refractory	20	302	Guatemala 88; Dominican Republic 52; Nicaragua 50.
Nonrefractory	173,406	161,955	United States 158,681.
Diamond, industrial ---- carats	5,000	30,000	United States 25,000; West Germany 5,000.
Diatomite and other infusorial earth	9,081	15,505	Argentina 4,513; Brazil 2,982.
Feldspar	--	709	Nicaragua 301; Venezuela 261; Costa Rica 100.
Fertilizer materials:			
Crude, phosphatic	1,973	5,239	All to United States.
Manufactured:			
Nitrogenous, including urea	77,899	31,076	Nicaragua 9,499; Peru 7,350; El Salvador 4,700.
Phosphatic	98,754	65,248	United States 25,096; Bermuda 18,384; West Germany 10,530.
Potassic	289	943	Guatemala 942.
Other including mixed	446	729	United States 514; Brazil 104.
Ammonia	3,466	4,525	Costa Rica 4,000; Guatemala 504.
Fluorspar:			
Acid grade	382,810	546,097	United States 512,913.
Metallurgical grade	635,537	531,049	United States 455,084; Canada 74,106.
Graphite, natural	57,228	58,429	United States 58,404.
Gypsum:			
Crude ---- thousand tons	1,187	1,227	United States 1,159.
Calcined ---- do	53	11	All to United States.
Lime	1,205	591	United States 233; Belize 165; El Salvador 101.
Perlite	1,183	2,614	Colombia 715; Cuba 416; Brazil 285.
Precious and semiprecious stones, except diamond ---- kilograms	3,050	358	United States 165; Japan 76; Canada 64.
Salt ---- thousand tons	3,929	4,470	Japan 3,324; United States 865.
Sodium and potassium compounds:			
Sodium compounds:			
Sodium carbonate	797	599	Chile 500; Venezuela 71.
Sodium hydroxide	5,060	5,949	West Germany 2,703; Argentina 2,373.
Sodium sulfate	65,785	85,946	Brazil 57,283; Venezuela 14,139.
Potassium compounds	28	5	Peru 2; Ecuador 1.
Stone, sand and gravel:			
Dimension stone	15,210	10,236	United States 10,111.
Crushed rock	25,504	18,805	United States 18,646.
Limestone, dolomite, calcite	4,403	1,967	United States 1,449; U.S.S.R. 354.
Quartz and quartzite	5,735	4,407	United States 4,404.
Sand:			
Construction	3,371	3,546	All to United States.
Glass	28,074	23,979	Guatemala 23,694.
Strontium minerals	21,358	27,164	Mainly to United States.
Sulfur:			
Elemental, all forms thousand tons	843	1,906	United States 981.
Sulfuric acid	3,906	62	Costa Rica 21; Ecuador 21; Panama 20.
Talc, steatite, soapstone, pyrohyllite	542	--	
Wollastonite	2,102	1,727	All to United States.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural (including gilsonite)	37	65	United States 50; Israel 10.
Carbon black	789	1,950	Brazil 935; Costa Rica 661; Guatemala 354.
Coal and coke	2	5	All to United Kingdom.
Gas, natural ---- million cubic feet	1,971	438	All to United States.
Petroleum:			
Crude thousand 42-gallon barrels	--	1,924	Netherlands Antilles 1,384; Uruguay 410.
Refinery products:			
Gasoline ---- do	158	359	United States 216; Colombia 142.
Kerosine ---- do	109	--	
Distillate fuel oil ---- do	192	2,295	West Germany 1,265; United States 572; Netherlands 153.
Residual fuel oil ---- do	4,826	7,757	United States 2,301; West Germany 1,287; Bahamas 888.
Lubricants ---- do	1	1	Mainly to United States.

Table 2.—Mexico: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other:			
Liquefied petroleum gas thousand 42-gallon barrels	(1)	4,930	Belize 4,016.
Mineral jelly and wax do	37	21	Mainly to United States.
Asphalt do	2,629	1,117	Do.
Total do	7,952	16,480	

[1] Less than ½ unit.
[2] Source: Consejo de Recursos Naturales No Renovables, Gerente de Estudiòs Economicos. Anuario Estadistico de la Mineria Mexicana 1973, 1974, Mexico, D.F., 1974, 146 pp. and 1975, 157 pp.
Source: Unless otherwise specified, official Mexican export returns.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	17,950	30,496	United States 24,801; French Guiana 4,397.
Oxide and hydroxide	91,922	102,255	Mainly from United States.
Metal including alloys, all forms	36,971	46,884	United States 34,109.
Arsenic:			
Natural sulfides	58	--	
Trioxide, pentoxide, acids	1	23	Mainly from United States.
Metal including alloys, all forms	6	--	
Beryllium metal including alloys, all forms kilograms	2,600	3,375	Mainly from United States.
Bismuth metal including alloys, all forms do	4,636	2,065	Do.
Cadmium metal including alloys, all forms do	33	1,580	France 1,365; United States 137.
Chromium:			
Chromite	36,793	53,082	United States 42,499; Cuba 7,300.
Oxide and hydroxide	4	133	United States 124.
Cobalt:			
Oxide and hydroxide	134	120	Belgium-Luxembourg 116.
Metal including alloys, all forms	44	62	Belgium-Luxembourg 44; United States 18.
Columbium and tantalum, tantalum metal including alloys, all forms kilograms	578	448	All from United States.
Copper metal including alloys:			
Scrap	1,531	947	Mainly from United States.
Copper sulfate	2	1	NA.
Unwrought	495	5,471	United States 3,881; Chile 1,468.
Semimanufactures	1,535	1,383	United States 883; West Germany 202.
Gold metal, unworked or partly worked troy ounces	4,598	1,756	United States 585; West Germany 490; Italy 392.
Iron and steel:			
Ore and concentrate, gross weight	74,671	37,203	Panama 24,251; Peru 12,794.
Metal:			
Scrap	966,854	793,162	United States 786 286.
Pig iron, including cast iron	119,141	53,896	United States 42,117; Colombia 5,807; Poland 5,585.
Sponge iron, powder and shot	1,606	2,040	United States 1,710.
Ferroalloys	4,419	9,741	United States 8,458.
Steel, primary forms	12,233	151,725	United States 114,573.
Semimanufactures [2]	374,219	550,757	United States 258,459; West Germany 86,249.
Lead:			
Oxides	90	74	United States 12.
Metal including alloys, all forms	118	274	United States 182.
Magnesium metal including alloys, all forms	2,791	2,004	United States 1,518; Norway 387.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Manganese:			
Ore and concentrates, gross weight	8,342	24,382	United States 19,933; France 4,449.
Oxides	1,417	1,709	United States 1,212; Japan 459.
Mercury ... 76-pound flasks	26	27	West Germany 10; United States 8; Netherlands 7.
Molybdenum:			
Ore and concentrate, gross weight	522	981	United States 835; Chile 103.
Metal including alloys, all forms	9	8	United States 6.
Nickel:			
Matte, speiss, similar materials	400	818	France 359; Cuba 272; United States 132.
Metal including alloys, all forms	1,613	2,215	United States 1,900.
Platinum-group metals, all forms:			
Palladium ... troy ounces	6,809	3,329	Switzerland 1,469; United States 938; U.S.S.R. 623.
Platinum ... do	848	1,436	United States 1,320.
Other ... do	657	2,600	Untied States 2,512.
Rare-earth metals:			
Oxides and fluorides	50	79	United States 72.
Metals including alloys kilograms	48	48	All from United States.
Selenium, elemental ... do	3,807	5,751	Peru 5,217.
Silver metal including alloys troy ounces	43,111	35,872	Sweden 19,098; United States 6,618.
Tellurium, elemental ... kilograms	278	378	United States 336.
Tin:			
Ore and concentrate, gross weight	3,011	2,190	United States 1,521; Australia 322.
Oxides	89	39	United Kingdom 22; United States 12.
Metal including alloys, all forms	215	462	United States 458.
Titanium:			
Ore and concentrate, gross weight	1,724	2,107	Australia 1,858.
Oxides	169	762	United States 524; Canada 85.
Slag and residues	28,379	38,936	Canada 28,936; Australia 10,000.
Metal including alloys, all forms	22	25	United States 22.
Tungsten metal including alloys, all forms	37	29	United States 28.
Uranium and thorium oxides kilograms	[3] 1	12	United States 11; Austria 1.
Vanadium pentoxide	110	268	United States 236; Republic of South Africa 32.
Zinc:			
Oxides	44	230	United States 221.
Metal including alloys, all forms	88	297	United States 230.
Zirconium ore and concentrates, gross weight	5,216	4,932	United States 4,740.
Other:			
Ore and concentrate, n.e.s	8	16,548	Peru 16,491.
Ash and residue containing nonferrous metals	100	689	All from United States.
Oxides, hydroxides, peroxides of metals, n.e.s	735	937	United States 690.
Metals including alloys, all forms:			
Metalloids:			
Phosphorus, elemental (white, black, red)	19,400	21,544	United States 21,359.
Silicon	1,059	1,289	United States 648; France 177.
Other, n.e.s	21	14	Mainly from United States.
Alkali and alkali earth	3,355	3,312	United States 3,206.
Base metals including alloys,		4,516	France 2,507; United States 835.
Pyrophoric alloys _ kilograms	1,925		
all forms, n.e.s	274	415	United States 178; Switzerland 130.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	1,659	1,416	United States 1,182.
Dust and powder of precious and semiprecious stones, except diamond ... kilograms	14	3	United States 2; France 1.
Grinding and polishing wheels and stones	177	296	United States 219; United Kingdom 29.
Asbestos, crude	51,400	56,919	Canada 34,174; United States 11,718.
Barite and witherite	63	162	United States 69.
Boron materials:			
Crude natural borates	58	1,830	United States 1,253; Peru 203; Spain 202.
Oxide and acid	1,686	2,032	United States 1,975.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Bromine	200	164	United States 102.
Cement	61,699	95,834	United States 7,052.
Chalk ---- kilograms	182	2	All from United States.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Fuller's earth	639	830	United States 5.
Kaolin (china clay)	34,569	41,936	United States 41,191.
Refractory	111,095	130,847	United States 126,045.
Other	1,949	3,848	United States 3,310.
Products:			
Refractory (including nonclay bricks)	4,347	19,655	West Germany 11,146; United States 5,141.
Nonrefractory ---- value, thousands	r $353	$466	United States $38.
Cryolite and chiolite	11	20	All from People's Republic of China.
Diamond:			
Gem, not set or strung ---- carats	12,810	2,140	Belgium-Luxembourg 1,715.
Industrial ---- thousand carats	5,200	4,895	United States 3,610; Belgium-Luxembourg 1,005.
Powder ---- do	3,065	4,805	Belgium-Luxembourg 2,050; Netherlands 2,015; United States 665.
Diatomite	258	247	United States 4.
Feldspar and nepheline syenite	2,724	2,641	United States 1,955; Canada 686.
Fertilizer materials:			
Crude:			
Nitrogenous [4]	10,998	10,214	All from Chile.
Phosphatic rock ---- thousand tons	1,290	1,492	United States 942; Morocco 510.
Manufactured:			
Nitrogenous	218,869	225,760	United States 154,472; West Germany 34,106.
Phosphatic	4	139	All from United States.
Potassic	98,244	90,973	United States 90,338.
Other, including mixed	2,361	2,522	Chile 1,577; United States 944.
Ammonia	206,714	254,200	United States 136,917; Kuwait 25,621; Netherlands 25,600.
Fluorspar	10	27	Mainly from West Germany.
Graphite, natural	294	337	United States 276; Canada 58.
Gypsum	28,904	33,842	United States 419.
Iodine	150	167	Chile 117; Japan 24.
Lime	4,736	4,499	United States 2,201.
Magnesite	7,066	2,882	Yugoslavia 2,484; United States 396.
Mica:			
Crude, including splittings and waste	257	348	Brazil 258; United States 51; Argentina 36.
Worked, including agglomerated splittings	28	40	United States 25; Spain 5.
Pigments, mineral:			
Natural, crude	18	30	United States 4; West Germany 3.
Iron oxides, processed	84	98	United States 89.
Precious and semiprecious stones, except diamond:			
Natural ---- kilograms	444	5,316	United States 5,224.
Manufactured ---- do	2,492	1,514	France 1,334; Spain 150.
Pyrite, unroasted	32	393	United States 353; West Germany 40.
Salt	654	1,400	United States 1,256.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	36,277	44,445	United States 41,627.
Caustic potash, sodic and potassic peroxides	2,002	1,725	Belgium-Luxembourg 583; United States 570; West Germany 303.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	7,085	7,283	Itay 5,588; Guatemala 1,145.
Worked:			
Slate	692	635	Mainly from Italy.
Paving and flagstone	133	50	NA.
Other	6,796	7,236	United States 1,179.
Dolomite, chiefly refractory grade	9	536	United States 510.
Gravel and crushed rock	5,287	2,358	United States 898.
Limestone	--	54	All from United States.
Quartz and quartzite	1,582	5,258	United States 2,887; Belgium-Luxembourg 1,695.
Sand, excluding metal bearing	287,391	378,415	United States 374,087.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Strontium	([5])	2	All from United States.
Sulfur:			
Elemental:			
Other than colloidal	518	782	United States 364.
Colloidal	105	161	United States 154.
Sulfur dioxide kilograms	212	--	
Sulfuric acid and oleum	21,244	31,164	Netherlands 19,705; United States 10,034.
Talc, steatite, soapstone, and pyrophyllite:			
Pyrophyllite	315	233	All from United States.
Steatite	89,253	102,148	United States 97,906.
Talc	368	515	United States 363; Italy 100.
Vermiculite	591	569	United States 276; Spain 189.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet	--	74	United States 72.
Other	130	1	Mainly from Cuba.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	5	12,481	All from United States.
Slag and ash, n.e.s	93	179	United States 137.
Oxides and hydroxides of magnesium, strontium, barium	533	310	United States 281.
Buiding materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	511	699	United States 204.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,013	698	Mainly from United States.
Carbon black and gas carbon:			
Carbon black	2,114	2,160	United States 1,160; Canada 651.
Gas carbon	226	1	Mainly from United States.
Coal, all grades, including briquets	237,303	368,072	Untied States 365,467.
Coke and semicoke	140,232	171,544	United States 167,278.
Gas, hydrocarbon, natural million cubic feet	13,621	11,561	United States 11,259.
Hydrogen, helium and rare gases	1,172	882	United States 272.
Peat including peat briquets and litter	838	433	All from United States.
Petroleum:			
Crude thousand 42-gallon barrels	22,348	9,482	Venezuela 8,865.
Refinery products:			
Gasoline do	9,804	6,263	Netherlands Antilles 2,079; Venezuela 894; United States (including Virgin Islands) 737.
Kerosine do	112	86	NA.
Distillate fuel oil do	4,591	2,846	Venezuela 614; United States (including Virgin Islands) 516; Netherlands Antilles 245.
Residual fuel oil do	1,831	822	United States 284; Venezuela 227; Netherlands Antilles 123.
Lubricants do	150	108	United States 48.
Other:			
Liquefied petroleum gas [6] do	12,742	10,041	United States 7,498.
Mineral jelly and wax do	174	253	United States 134; People's Republic of China 76.
Bitumen and other residues and bituminous mixtures, n.e.s do	269	126	United States 24.
Petroleum coke do	1,789	734	United States 733.
Pitch and pitch coke do	86	136	United States 134.
Unspecified do	849	199	United States 186.
Total do	32,397	21,614	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	18,572	15,376	United States 13,625.

[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] May include a small quantity of manufactured materials.
[5] Less than ½ unit.
[6] Includes that derived from natural gas plants.

COMMODITY REVIEW

METALS

Aluminum.—Final agreement has been reached on the establishment of a binational aluminum complex that will utilize Jamaican bauxite to produce aluminum metal in Mexico. It will include an alumina plant in Southern Jamaica and an aluminum smelter at Coatzacoalcos, Veracruz, Mexico. The Jamaican Government will own 51% of the alumina plant; the Mexican Government, 29%; and Kaiser Aluminum & Chemical Corp., 20%. The Mexican Government will own 51% of the smelter; the Jamaican Government, 29%; and Kaiser, 20%. The initial capacity of the smelter will be approximately 120,00 tons per year of aluminum ingot.

Alumínio, S.A. de C.V., with a smelter near Veracruz, was Mexico's only existing primary aluminum producer in 1975. It was proceeding with plans to increase the capacity of the smelter from 40,000 tons per year of aluminum metal to 90,000 tons per year, with completion of the expansion scheduled for 1977.

Copper.—Major mine, smelter, and refinery projects underway were designed to make Mexico a major exporter of copper.

Cía. Minera de Cananea, S.A., the nation's largest producer, planned to increase capacity from its present 40,000 tons of blister copper per year to 70,000 tons per year by 1976 and 140,000 tons per year by 1982.

Cia. Mexicana de Cobre, S.A., continued work on its mine, mill, and smelter complex at the La Caridad deposit at Nacozari, Sonora, with initial operations scheduled for late 1976 at a rate of 140,000 tons of copper per year. It is planned to increase the capacity to 250,000 tons per year by 1980. Ore reserves have been estimated at 700 million tons grading 0.7% copper and 0.02% molybdenum. This is the largest project of this type ever initiated in Mexico and will require an initial investment of approximately $500 million.

Cobre de Sonora, S.A., continued with initial exploration and development programs at the Santa Rosa and Pilares mines in Mocorito, Sonora. These mines have reported copper ore reserve totaling 130 million tons. Plans have been made to bring these properties into production at a rate of 37,000 tons of copper per year.

Cía. Minera Cuprífera la Verde, S.A., was in the initial stages of developing a promising copper deposit in the State of Michoacan. Plans called for an initial production of 30,000 tons of copper per year. Ore reserves were reported to exceed 50 million tons with a grade of 0.7% copper.

Expansions in electrolytic copper refining capacities were planned so that Mexico would be able to export both electrolytic copper and finished copper products. Industria Minera Mexico, S.A., was to build an electrolytic copper plant in San Luis Potosí, S.L.P., with an annual capacity of 110,000 tons. Additionally, Mexicana de Cobre was to construct an electrolytic copper plant at Guaymas, Sonora, in conjunction with the development of the La Caridad copper complex with a capacity of 140,000 tons per year. Both projects are to be completed by mid-1978.

Iron and Steel.—In an effort to obtain self-sufficiency in iron and steel production by 1977, Mexico was accelerating the development of iron ore reserves and adding additional steelmaking capacity to its industry.

Operation began at the important Peña Colorada iron ore deposit in Colima, with estimated reserves of more than 100 million tons. Operated by Consorcio Minero Benito Juarez, Peña Colorada is a joint venture of the Federal Government and Mexico's four largest steel companies. It will produce approximately 1.5 million tons per year of 65% grade iron ore pellets. Plans were completed to double the capacity to 3 million tons per year by 1978.

Altos Hornos de Mexico, S.A., was in the midst of a large-scale expansion program at its El Anteojo iron ore deposits in Chihuahua, which contain estimated reserves of approximately 100 million tons.

Fundidora Monterrey, S.A., announced facility expansions that will increase its present steelmaking capacity of 900,000 tons per year to 1.5 million tons per year by yearend 1976. The program will include the construction of a concentrate plant and an iron ore pelletizing plant as the expansion of blast furnace and steel plate rolling facilities.

El Grupo Acero, an affiliate of Hojalata y Lamina, S.A. (HYLSA) announced plans for the construction of a sponge iron plant at Xeoxtla, Pueblo, to produce 700,000 tons per year by 1976 for the purpose of supplying the country's small- and medium-sized steel industries with a substitute for imports of scrap iron.

The major contributor to Mexico's steel developing program is the fully integrated iron ore to steel Las Truchas complex under construction on the Pacific Coast by the Government-owned Cía. Siderúrgica Lázaro Cárdenas-Las Truchas, S.A. (SICARTSA). Backed by nearby ore reserves, the complex will include pelletizing plants, blast furnaces, basic oxygen furnaces (BOF) and continuous casting systems. Construction of this complex will advance through four stages, culminating in 11 million tons of steel ingot capacity by 1995. Stage 1, which will provide a capacity of 1.3 million tons of steel ingot per year, is now under construction and scheduled for startup in August 1976. When completed, the SICARTSA project will be one of the largest steel complexes in Latin America. It is one of the largest construction endeavors ever attempted in Mexico and represents an initial investment of $1.1 billion.

The Government established the Mexican Steel Research Institute, a decentralized Federal Government agency that is to carry out technological and development programs for the country's steel industry. One of its primary aims is to develop a national steel technology as well as to check and analyze all technological processes now imported by local steel companies whether state-owned or privately operated.

Lead and Zinc.—A number of expansions in the lead and zinc industries, in which silver is an important byproduct, were either completed or in the planning stages in 1975.

Industria Minera Mexico S.A. expanded its mine operations at San Martín, Zac., Charcas, S.L.P., and in the State of Chihuahua. At Taxco, Gro., it made major additions to facilities including a new central hoisting shaft and a 2,200-ton-per-day flotation mill. Additionally, it completed initial engineering design for a new electrolytic zinc refining complex in San Luis Potosí, S.L.P. It will have a planned capacity of 115,000 tons per year of zinc metal and is expected to be operational in 1977.

Industria Peñoles, S.A., was continuing with the construction of a new lead smelter and refinery at Torreón, Coahuila, which will have an annual capacity of 190,000 tons of lead per year.

Zincamex, S.A., the Government-owned zinc refining complex at Saltillo, planned the construction of a 15,000-ton-per-year electrolytic zinc refinery that would complement its present 30,000-ton-per-year retort zinc plant.

Manganese.—Cía. Minera Autlan, S.A. de C.V., was in the process of expanding its mine production capacity at its Molango, Hidalgo, mines 30% by 1976. Additionally, Autlan was constructing a new plant in Tomás, Veracruz, for producing high-carbon ferromanganese that will increase its production of ferroalloys by 150% when completed in early 1976.

Silver.—Three important projects were under way during 1975 which when fully operational should insure Mexico's ability to regain world leadership in silver production, a position it has not held since 1963. The Cía. Minera Lampaso mine in Sonora placed its first unit in operation in 1975 with an annual capacity of 2 million troy ounces. Full-scale operations were expected by 1976 at a rate of 12 million troy ounces of silver per year.

Cía. Minera Las Torres, S.A., a joint venture headed by Industrias Peñoles, S.A., was developing four mining properties in the State of Guanajuato. First stage plans called for the production of 7 million troy ounces of silver per year as well as 50,000 troy ounces of gold.

A third project involved development of silver mining properties near Real de Angeles, Gto., by a joint venture involving the Banco de Comercio and the Placer Group of Canada with a proposed production of 5 million troy ounces of silver per year.

Additionally, the Government-owned Cía. de Real del Monte y Pachuca, S.A., increased its milling capacity substantially and planned to begin commercial exploitation of several new potentially highly productive silver veins in the State of Hidalgo.

NONMETALS

Cement.—The cement industry in 1975 was basically comprised of 7 operating groups which among them operated 23 of the country's 28 plants. Together the 4 largest groups with 17 plants accounted for 73% of the sales.

The following tabulation shows the distribution of sales in 1975:

Cement group	Number of plants	Percent of market
Tolteca	8	25.5
Mexicanos/Maya	5	17.8
Anahuac	2	18.0
Cruz Azul	2	12.0
Guadalajara	2	7.9
Apasco	2	9.5
Chihuahua	2	2.6
Others	5	6.7
Total	28	100.0

The cement industry has been expanding very rapidly. At yearend 1975 the industry had a total installed capacity of approximately 13.5 million tons compared with 7.9 million tons at yearend 1970. Expansion programs underway in the project stage are expected to increase the installed capacity by 27%. In several cases the expansion programs will enable the companies involved to have a very definite export capability.

Fertilizer Materials.—A Government-owned holding company, Productos Básicos para Fertilizantes, S.A. (PROFERSA), was formed that in effect joined six established and newly formed state-owned corporations which produce a wide range of minerals used to produce fertilizers such as sulfur, potassium, and phosphate rock. PROFERSA will hold a minimum of 51% of the shares of such companies, which include all of the basic producers of these minerals. The country's only domestic producer of fertilizer products, the Government-owned Guanos y Fertilizantes de Mexico, S.A. (GUANOMEX), has not as yet become incorporated into the PROFERSA holding company, although it is expected that it would be at least partially absorbed during 1976.

GUANOMEX announced a major expansion program to be completed over a 4-year period. It will involve the construction and/or expansion of 10 plants to be partially financed by a $50 million loan from the World Bank. It is expected that these new projects will make Mexico self-sufficient in finished fertilizer production by the end of the decade.

Nitrogen.—Petróleos Mexicanos (PEMEX), the nation's largest producer of anyhydrous ammonia, completed the first year's operation at near capacity of a 900-ton-per-day plant at Cosoleacaque, Veracruz. PEMEX was continuing with engineering and construction on three other new anhydrous ammonia plants with a combined production capacity of 2,900 tons per day.

Phosphate Rock.—A new corporation, Roca Fosfórica Mexicana, S.A. (ROFOMEX), was formed to explore and develop the promising deposits of phosphate rock in an area north of La Paz, Baja California. The company is 51% Government-owned and will be a part of the PROFERSA group. The deposits were extensively explored during 1975 with indications that approximately 150 million tons of ore had been delineated grading between 12% and 25% P_2O_5 with the geologic probability of much greater reserves in the area. At yearend 1975 bulk sampling was in progress for the purpose of metallurgical testing. If these results are promising it will be followed up by a 1,000-ton-per-day pilot plant.

Fluorspar.—Mexico's export oriented industry was further expanded during 1975. Industria Minera Mexico, S.A., announced plans for a new fluorspar flotation mill in Santa Bárbara, Chihuahua, with a monthly production capacity of 15,000 tons. Cía. Florita del Río Verde, S.A., a subsidiary of Industrias Peñoles, was undertaking to double its metallurgical acid-grade fluorspar capacity. Minera Frisco completed its first year of operations at its new installation at San Francisco del Oro, Chihuahua, which will have an annual capacity of 75,000 tons of acid-grade fluorspar concentrate.

Mexico moved toward the upgrading of fluorspar output as opposed to its export as metallurgical- or acid-grade products, with the initiation of hydrofluoric acid production at the new Matamoros, Tamps., plant of Química Fluor, S.A. de C.V., at its rated capacity of 70,000 tons per year of hydrofluoric acid. Most of the firm's hydrofluoric acid production will be exported.

The Mexican Fluorspar Institute, of which almost all fluorspar producers of the country are members, became fully operative in 1975. The Institute, specializing in promotion and marketing, will attempt to develop and coordinate medium- and long-range programs for fluorspar exports and export prices and promote fluorspar uses.

Sulfur.—As in past years, Mexico's sulfur industry was primarily based on the Frasch-type operations of the Government-controlled Azafrera Pan Americana, S.A., and Cía. Exploradora del Istmo, S.A. with large operations in the Tehuantepec region. The industry continued to be largely export oriented. These companies were also absorbed into the PROFERSA group.

MINERAL FUELS

Petroleum.—Petróleos Mexicanos, S.A. (PEMEX), is the Government-owned organization having exclusive control over the Mexican petroleum industry from crude oil production through marketing. Additionally, it is the sole authorized producer of basic petrochemicals.

The year 1975 was a very successful one for PEMEX. Not only did production increase substantially but the potential production was much larger than current or projected demand. Unless a political decision to the contrary is made, Mexico should soon become a major exporter of crude and refined petroleum products. The rapid expansion of Mexico's petroleum industry had been due largely to the discovery in 1972, and the subsequent rapid development, of a major highly productive petroleum Province situated in the States of Chiapas and Tabasco in southern Mexico. The area as a whole is commonly referred to as the Reforma trend.

Production in the Reforma area in 1972 amounted to only 0.4 million barrels, increasing to 11 million barrels in 1973 and 62 million barrels in 1974. In 1975, production amounted to 118 million barrels, or an average of 234,000 barrels per day. At yearend 1975, 7 distinct fields in the region, with 81 wells, were producing at the rate of 440,000 barrels per day. PEMEX projects that production in the Reforma area will exceed 500,000 barrels per day at yearend 1976.

The extent of the productive area in the Reforma trend has not been fully delineated. Exploration efforts seemed to indicate that the fields extend northeast into the Gulf of Campeche, eastward toward the Guatemalan border, south toward to Tuxtla Gutierrez, and west as far as Minatitlan.

PEMEX had been reluctant to release the full extent of reserves in the Reforma trend pending a complete evaluation. Officially, hydrocarbon reserves in Mexico were set at 6.3 billion barrels at yearend 1975 as compared with 5.8 billion barrels at yearend 1974. Unofficially, it has been estimated that reserves, including those in the Reforma region, might reasonably amount to more than double this quantity.

With the Reforma trend having established an expanded production base, PEMEX moved forward rapidly with the construction of extensive new downstream facilities. These included the building of new pipelines, expansion of terminal facilities, acquisition of new tankships, and the construction of new refineries. Additionally, desulfurization and petrochemical facilities were being expanded.

In 1975, PEMEX completed construction on 205 miles of oil pipelines, 78 miles of natural gas pipelines, and 1,506 miles of product pipelines. An additional 1,420 miles of pipelines of various types were in the design or construction stages at yearend.

The delivery of a new tankship during 1975 increased PEMEX's tanker fleet to 26 ships totaling 480,900 deadweight tons and having a load capacity of 3.7 million barrels. In 1975 PEMEX moved 99 million barrels in its own bottoms and 71 million barrels in leased vessels.

Installed primary distillation refining capacity at the six PEMEX refineries in operation at yearend 1975 was 785,000 barrels per day as compared with 590,000 barrels per day of installed capacity at yearend 1971. PEMEX had four new refineries under design or construction at yearend that would increase its refinery capacity by an additional 650,000 barrels per day by 1980.

Although Mexico has the potential for becoming a major U.S. supplier of crude and refined products, the impact on U.S. markets in 1975 was only minor. In 1975 Mexico exported 38.3 million barrels of crude petroleum, including 25.6 million barrels to the United States and 2.5 million barrels to Puerto Rico. By comparison, total U.S. imports of crude petroleum in 1975 amounted to 1.5 billion barrels. Also in 1975, U.S. exports of refined products to Mexico amounted to 15.4 million barrels while U.S. imports of refined products from Mexico were only 269,000 barrels.

The Mineral Industry of Morocco

By David G. Willard [1]

At the beginning of 1975, Morocco's mining industry was stimulated by quadrupled phosphate rock prices and continued strong demand, but by yearend, production and exports were decreasing. Weather, price resistance, and competition combined to curtail phosphate sales and erode posted prices, while rising petroleum costs hindered world industrial growth and undermined additional export markets. Aided by an expansionary government policy and its basically strong position, however, the industry was weathering the decrease and awaiting an improvement in conditions.

Exports of phosphate rock fell 30%, although late 1974 price gains held the decline in revenues to 14%, and output had a corresponding drop of 28%. At the same time, exports of most metals decreased, and the total value of metals exports slumped 42%. Production of metals decreased 8% in total tonnage, but individual commodities showed a mixture of gains and losses. Revenues from mineral exports declined 16% from 1974 to 1975.

The decline in mineral exports, coupled with a similar downturn in nonmineral exports and a continued rise in import expenditures for food and capital equipment, caused the trade deficit to swell in excess of $1 billion.[2] Morocco's economy suffered less damage than might have been expected, because of loans from the International Monetary Fund and the oil-producing countries. However, no signs had appeared of the recovery that was anticipated because weather and competition continued to depress phosphate prices.

Government policy showed no basic change from its previous viewpoint that the economy could ride out this troubled period and be in a position to take advantage of expanding markets when recovery occurred. Government programs assisted private companies to maintain production, employment, and prices—even at the expense of considerable stockpiling. About 1 million tons (7% of production) of phosphate rock went into stockpiles, along with about 30% of lead production, 60% of copper production, 45% of iron ore production, and 15% of the manganese mined. At yearend the Government boldly announced an expansionary budget for 1976 that included a 57% increase in investment expenditures. Predicated on recovery of phosphate and metals markets and the availability of large-scale external financing, the budget sought both to prevent current problems from delaying the country's development and to stimulate a budding recovery of private investment, which had been lagging ever since imposition of the Moroccanization laws in 1973. Major projects in the budget included the new port at Jorf Lasfar and its related phosphate and petrochemicals facilities, the Nador steel mill, a major expansion of the Mohammedia oil refinery, and construction of several new cement plants.[3]

In the crucial area of energy, efforts were being pushed in several directions at once. Morocco lacks significant oil and gas reserves, and its deteriorating relations with neighboring Algeria threatened to close off the principal source of new

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[1] Economist, Division of Nonmetallic Minerals.

[2] Where necessary values have been converted from Moroccan dirhams (DH) to U.S. dollars at the rate of DH4.40=US$1.00 in 1974 and DH4.00 =US$1.00 in 1975.

[3] U.S. Embassy, Rabat, Morocco. State Department Airgrams A-15, Jan. 30, 1976, and A-68, June 17, 1976.

natural gas supplies. The Government-owned Bureau de Recherches et de Participation Minières (BRPM) was accelerating its onshore search for minerals. A new agreement was signed with a consortium headed by Phillips Petroleum Co. for offshore oil exploration, and research and drilling were being carried out on the half dozen concessions already awarded off the country's coasts. Studies were being conducted in the U.S.S.R., the United States, Canada, and Brazil with BRPM funding in the hope of devising a technology for exploiting the extensive oil shale deposits near Timahdit and Tarfaya. Also, research into the possibility of obtaining uranium as a phosphate byproduct was being discussed with a U.S. company.

A major addition to the country's actual and potential mineral supply was acquired late in the year when the former colony of Spanish Sahara was partitioned between Morocco and Mauritania. Morocco's portion includes the rich Bu Craa phosphate mine and known but unexplored resources of several metals and oil shale. Government policy concerning the new territory, which was renamed "Western Sahara," was still undetermined, but indications were that it would follow the pattern established in the rest of the country; namely, a government monopoly of the phosphate industry (with the exception of Bu Craa, for which a joint venture was negotiated with Spain) and freedom for private prospecting and production of other minerals, with government assistance and investment where necessary. Foreign participation was also being encouraged.

PRODUCTION

Mineral production in Morocco declined in 1975. Output of phosphate rock was down 31% from 19.7 million tons in 1974 to 13.5 million tons in 1975. Production of minerals other than phosphate showed mixed results. Output of the more important metals was below 1974 levels. Lead production was down 26% to 104,000 tons in 1975 from 141,000 tons in 1974, and production of manganese declined 25%. Metal mining industries in which production increased included copper, which increased 9%; zinc, up 32%; cobalt, a gain of 12%; and iron ore, a small increase of 4%.

Among the nonmetallic minerals, production of pyrite and pyrrhotite, all of which is consumed in phosphate processing, decreased 60%. Output of fluorspar from the new El Hammam mine was more than double that of its initial year in 1974.

In the fuels sector, production of coal, natural gas, and crude petroleum increased. Coal production was 14% greater in 1975 than in 1974. Natural gas output was up 20%, and production of crude petroleum increased 60%.

Total value of all crude mineral production declined 38% to $701 million in 1975 from $1,132 million in 1974. Reduced output and lower prices for phosphate were responsible for almost the entire drop. The value of mined phosphate rock was down $431 million to $602 million in 1975 from $1,033 million in 1974, a decline of 42%. Total value of minerals other than phosphate remained virtually unchanged, amounting to $99 million in 1974 and $100 million in 1975. (These figures may not total exactly because of differences caused by rounding). The phosphate industry's proportion of total mineral value declined to 86% in 1975 from 91% in 1974. Other minerals experiencing a significant change in value included lead, which was down 34% to $25 million in 1975 from $38 million in 1974, and coal, which gained $9 million and was more than double its 1974 value.

Table 1.—Morocco: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 p
METALS			
Antimony concentrate:			
Gross weight	2,698	4,282	2,770
Metal content	1,133	2,141	1,191
Cobalt concentrate:			
Gross weight	10,157	12,518	14,007
Metal content	1,422	1,627	1,821
Copper concentrate:			
Gross weight	14,660	16,504	17,970
Metal content	4,251	4,951	4,852
Iron and steel:			
Iron ore, direct shipping, gross weight	374,149	531,287	554,156
Pig iron e	10,000	10,000	10,000
Steel e	1,000	1,000	1,000
Lead concentrate:			
Gross weight	158,830	141,430	104,327
Metal content	108,004	96,272	63,639
Manganese ore, chemical grade	r 146,149	174,781	130,947
Nickel content of cobalt ore e	200	r 250	280
Silver:			
From Imiter operation thousand troy ounces	r 919	889	853
Content of exported lead concentrate e do	r 2,599	r 2,252	2,180
Total e do	3,518	3,141	3,033
Tin:			
Concentrate:			
Gross weight	15	4	--
Metal content	10	3	--
Smelter, primary	12	12	12
Zinc concentrate:			
Gross weight	32,677	27,354	36,131
Metal content	18,299	18,000	20,956
NONMETALS			
Barite	102,691	87,778	128,770
Cement, hydraulic thousand tons	1,619	1,926	2,028
Clays, crude:			
Bentonite	5,729	3,313	3,276
Smectite	19,122	20,094	23,720
Other, including fuller's earth	5,630	4,343	5,893
Fertilizer materials, crude, natural, phosphate rock thousand tons	17,077	19,721	13,548
Fluorspar	--	19,050	47,421
Goethite	36	24	47
Mineral water cubic meters	16,869	16,874	22,994
Pyrite and pyrrhotite:			
Gross weight	407,098	508,787	203,789
Sulfur content	134,399	152,636	66,231
Salt, all types	27,601	36,054	60,000
MINERAL FUELS AND RELATED MATERIALS			
Coal, anthracite thousand tons	565	574	652
Fuel briquets e	6,000	6,000	6,000
Gas, natural:			
Gross production million cubic feet	2,302	2,081	2,498
Marketed do	2,221	1,991	2,498
Petroleum:			
Crude oil thousand 42-gallon barrels	320	191	306
Refinery products:			
Gasoline do	3,142	2,932	3,123
Jet fuel do	618	934	983
Kerosine do	627	574	754
Distillate fuel oil do	4,898	4,884	4,875
Residual fuel oil do	5,271	6,214	7,969
Other do	1,584	594	945
Refinery fuel and losses do	829	2,733	1,555
Total do	16,969	18,865	20,204

e Estimate. p Preliminary. r Revised.

[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.

TRADE

Rapidly rising prices of phosphate rock and other mineral commodities enabled Morocco's export revenues to keep pace with the higher costs of imported goods in 1974. A fourfold increase in phosphate rock prices was responsible for most of a 111% increase in total export revenues. Higher prices also raised the values of other mineral exports, particularly metals. However, equally rapid uptrends in the costs of imported mineral and nonmineral commodities canceled those gains and left the country's overall balance of trade slightly on the deficit side, little changed from 1973.

Morocco's trade position worsened appreciably in 1975. Phosphate exports fell 30%, and recession in world industrial markets caused a drop in exports of metals. These two factors brought about a 14% decline in the country's export revenues. Meanwhile, import expenditures continued to rise, fueled by increased food imports due to crop failures, capital equipment investments, and inflation; the balance of trade deficit soared above $1 billion.

Balances of mineral and nonmineral trade in 1973 through 1975 are shown in the tabulation below, in million dollars:

	1973	1974	1975
Exports:			
Minerals	266	1,152	971
Nonmineral	595	663	588
Total	861	1,815	1,559
Imports:			
Minerals	188	518	536
Nonmineral	889	1,504	2,062
Total	1,077	2,022	2,598
Balance of trade:			
Minerals	78	634	435
Nonmineral	−294	−841	−1,474
Total	−216	−207	−1,039

Source: Kingdom of Morocco. Statistiques du Commerce Exterieur. Annual editions for 1973, 1974, and 1975.

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

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal including alloys, all forms	601	566	Italy 230; France 209.
Antimony, ore and concentrate	2,796	4,084	United Kingdom 1,433; United States 726; France 576; Brazil 403.
Cobalt, ore and concentrate	10,549	14,547	France 8,008; People's Republic of China 6,000.
Copper:			
Ore and concentrate	14,319	17,586	West Germany 6,433; People's Republic of China 5,500; Belgium-Luxembourg 3,653.
Metal including alloys, all forms	1,146	1,433	France 482; Belgium-Luxembourg 252; Netherlands 223; West Germany 165.
Gold, waste and sweepings troy ounces	96,163	--	
Iron and steel:			
Ore and concentrate	--	10,200	All to West Germany.
Roasted pyrite	490,085	530,297	West Germany 222,845; Switzerland 116,510.
Metal:			
Scrap	61,016	79,800	Spain 70,968.
Ferroalloys	--	661	Spain 600.
Semimanufactures	30	1,077	Spain 1,000.

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

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Lead ore and concentrate	136,144	125,905	France 38,487; Tunisia 25,564; Spain 25,493; Belgium-Luxembourg 18,039.
Magnesium metal including alloys, all forms	10	--	
Manganese, ore and concentrate	115,108	164,940	United States 49,294; France 35,446; Netherlands 22,766.
Nickel metal including alloys, all forms	80	--	
Silver metal including alloys thousand troy ounces	895	270	Belgium-Luxembourg 203.
Titanium oxides kilograms	200	--	
Zinc:			
Ore and concentrate	21,649	26,449	West Germany 8,280; Belgium-Luxembourg 7,323; France 6,294.
Oxide	6,705	10,293	France 6,573; Belgium-Luxembourg 3,720.
Metal including alloys, all forms	57	50	France 39; Netherlands 11.
Other:			
Ore and concentrate	26,201	31,856	France 18,488; United Kingdom 13,358.
Ash and residue containing nonferrous metals	524	430	France 355; Spain 75.
Oxides, hydroxides, peroxides of metals, n.e.s	5	8	Tunisia 4; Libya 2; France 1; Algeria 1.
NONMETALS			
Barite and witherite	94,159	81,686	United Kingdom 37,196; United States 26,224; Netherlands 8,170.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	567	--	
Fire clay	5,182	7,472	NA.
Fuller's earth	14,808	22,142	Spain 15,573; Tunisia 2,935.
Other	--	(1)	All to United Kingdom.
Products:			
Refractory (including nonclay bricks)	5,768	5,624	Iraq 1,662; Lebanon 1,032; Iran 566.
Nonrefractory	133	462	Algeria 255.
Feldspar	--	5,500	All to United States.
Fertilizer materials:			
Crude phosphatic thousand tons	16,102	18,700	France 2,403; Poland 1,746; United Kingdom 1,542.
Manufactured:			
Nitrogenous	4,300	--	
Phosphatic	261,708	131,673	Brazil 38,732; Hungary 30,265; Cuba 20,000; Yugoslavia 13,100.
Gypsum and plasters	206,555	181,240	Nigeria 71,186; Portugal 24,232; United States 21,216; Japan 15,200.
Lime	129	225	Gibraltar 12.
Mica, all forms	165	--	
Pigments, mineral including processed iron oxides	51	1,704	France 98.
Precious and semiprecious stones, natural and manufactured thousand carats	42,993	16,585	United States 7,000; Italy 5,500; Switzerland 3,600.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	4,359	5,710	Italy 3,929.
Worked	325	340	NA.
Gravel and crushed rock	34,555	21,221	Gibraltar 1,600.
Quartz and quartzite	(1)	--	
Sand excluding metal bearing	79,997	79,990	Gibraltar 2,400.
Sulfur, elemental, all forms	64	209	NA.
Other nonmetals, n.e.s.:			
Unspecified, crude	171	--	
Slag, dross, and similar waste, not metal bearing	288	38	NA.
Building materials of asphalt, asbestos and fiber content, and unfired nonmetals, n.e.s	4,184	6,163	Liberia 2,986; Nigeria 2,424.

See footnotes at end of table.

Table 2.—Morocco: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades including briquets	30,690	34,135	Romania 9,000; Italy 6,980; United Kingdom 6,525; Tunisia 5,100.
Petroleum refinery products:			
Gasoline ------ 42-gallon barrels	r 67	--	
Kerosine ---- do	75,360	26,228	All to ship stores.
Distillate fuel oil ---- do	161,505	318,006	NA.
Residual fuel oil ---- do	8,228	12,979	NA.
Lubricants ---- do	r 3,933	3,111	Mainly to ship stores.
Other:			
Liquefied petroleum gas ---- do	1,169	--	
Unfinished light oils ---- do	389,915	106,000	NA.
Other light oils ---- do	45,586	414	All to ship stores.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	--	(1)	Mainly to France.

r Revised. NA Not available.
[1] Less than ½ unit.

Table 3.—Morocco: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Bauxite and concentrate	(1)	930
Oxide and hydroxide	929	1,533
Metal including alloys, all forms	3,828	5,740
Antimony metal including alloys, all forms	36	7
Arsenic trioxide, pentoxide, acids	13	23
Bismuth metal including alloys, all forms ---- kilograms	197	177
Cadmium metal including alloys, all forms ---- do	500	776
Chromium:		
Oxide and hydroxide	6	7
Metal including alloys, all forms ---- kilograms	15	10
Cobalt:		
Oxide and hydroxide ---- do	14	28
Metal including alloys, all forms ---- do	38	30
Columbium and tantalum: Tantalum including alloys, all forms ---- do	--	1
Copper:		
Copper sulfate	6	1
Metal including alloys, all forms	4,163	5,054
Gold metal, unworked or partly worked ---- troy ounces	14,147	1,544
Iron and steel:		
Roasted pyrite	3,080	--
Metal:		
Scrap	28	(1)
Pig iron including cast iron	2,067	2,818
Sponge iron, powder, shot	85	106
Ferroalloys	296	395
Steel, primary forms	8,097	17,023
Semimanufactures:		
Bars, rods, angles, shapes, sections	187,986	202,226
Universals, plates, sheets	90,678	92,312
Hoop and strip	9,879	14,297
Rails and accessories	1,830	11,089
Wire	11,099	14,992
Tubes, pipes, fittings	19,111	21,424
Castings and forgings, rough	154	175
Lead:		
Ore and concentrate	(1)	46,267
Oxides	253	250
Metal including alloys:		
Scrap	2	40
Unwrought	2,398	2,139
Semimanufactures	74	146
Lithium:		
Oxides	(1)	12
Elemental ---- kilograms	44	3
Magnesium metal including alloys, all forms ---- do	95	56
Manganese:		
Ore and concentrate	28	177
Oxides	56	42

See footnotes at end of table.

Table 3.—Morocco: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS—Continued		
Mercury:		
Oxides ---- kilograms --	17	17
Metal ---- 76-pound flasks --	74	68
Molybdenum:		
Oxides ---- kilograms --	5	13
Metal including alloys, all forms ---- do ----	213	120
Nickel:		
Matte, speiss, similar materials	--	4
Metal including alloys:		
Scrap	2	--
Unwrought	5	12
Semimanufactures	506	677
Platinum-group metals including alloys ---- troy ounces --	9	354
Rare-earth metals:		
Compounds, not further described ---- kilograms --	11	677
Metals including alloys ---- do ----	382	142
Selenium, elemental ---- do ----	109	302
Silver metal including alloys ---- thousand troy ounces --	5,582	1,954
Tin:		
Oxides	(1)	10
Metal including alloys, all forms	r 356	237
Titanium:		
Oxides	1,014	707
Metal including alloys, all forms ---- kilograms --	35	4
Tungsten metal including alloys, all forms ---- do ----	34	11
Vanadium oxides ---- do ----	NA	2
Zinc:		
Oxide	570	323
Metal including alloys:		
Scrap	100	(1)
Blue powder	49	32
Unwrought	1,887	1,653
Semimanufactures	239	224
Zirconium and hafnium metal including alloys, all forms:		
Zirconium ---- kilograms --	--	2
Hafnium ---- do ----	5	--
Other:		
Ores and concentrates of metals, n.e.s	(1)	30
Oxides, hydroxides, and peroxides of metals, n.e.s ---- kilograms --	r 812	333
Thorium and uranium compounds, not further described ---- do ----	NA	2
Metals including alloys, all forms:		
Cermets ---- do ----	--	34
Gallium, indium, and thallium ---- do ----	--	8
Metalloids, n.e.s ---- do ----	5,256	41
Pyrophoric alloys ---- do ----	134	382
Tellurium and arsenic ---- do ----	NA	2
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	17	38
Grinding and polishing wheels and stones	273	304
Asbestos	3,400	6,718
Barite	2	2
Boron materials:		
Crude natural borates	30	99
Oxide and acid	6	4
Bromine ---- kilograms --	166	51
Cement	45,437	12,545
Chalk	3,784	3,687
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s.:		
Bentonite ---- kilograms --	45	75
Fire clay	11,921	11,199
Fuller's earth	500	8
Kaolin (china clay)	3,904	4,959
Other	156	94
Products:		
Refractory (including nonclay bricks)	1,964	2,159
Nonrefractory	4,456	2,834
Cryolite and chiolite ---- kilograms --	2	--
Diamond, industrial ---- carats --	2,000	NA
Diatomite and other infusorial earth	360	352
Feldspar	179	119
Fertilizer materials, crude and manufactured:		
Nitrogenous	177,316	187,179
Phosphatic ---- kilograms --	45	110
Potassic	39,361	58,203
Other including mixed	r 1,836	35,182

See footnotes at end of table.

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

Commodity	1973	1974
NONMETALS—Continued		
Fluorspar	10	20
Graphite, natural	12	9
Iodine kilograms	201	357
Lime	3,855	10,030
Magnesite	322	401
Mica:		
Crude including splittings and waste	26	17
Worked including agglomerated splittings	1	1
Pigments, mineral, n.e.s.:		
Natural, crude	236	456
Iron oxides, processed	522	559
Precious and semiprecious stones, natural and manufactured kilograms	347	863
Salt	9,492	5
Sodium and potassium compounds, n.e.s.:		
Sodium hydroxide	12,633	13,885
Potassium hydroxide	119	146
Peroxides of potassium and sodium kilograms	15	83
Stone, sand and gravel:		
Dimension stone	647	1,151
Dolomite, chiefly refractory grade	1,299	970
Gravel and crushed rock	24	242
Quartz and quartzite	9	(1)
Quartz, electronic grade grams	900	200
Sand excluding metal bearing	16,899	20,209
Sulfur:		
Elemental, all forms	35,056	77,534
Sulfur dioxide	105	32
Sulfuric acid	130,263	32,690
Talc, steatite, soapstone, pyrophyllite	1,334	1,007
Other nonmetals, n.e.s.:		
Crude:		
Vermiculite, perlite, chlorite	2	1
Unspecified	511	318
Oxides and hydroxides of magnesium, strontium, barium	16	3
Fluorine	8	1
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	6	(1)
Carbon black and gas carbon	2,902	3,925
Coal and coke, including briquets	38,488	27,618
Hydrogen, helium, rare gases	8	12
Peat including peat briquets and litter	100	30
Petroleum:		
Crude thousand 42-gallon barrels	16,938	19,187
Refinery products:		
Gasoline do	r 44	67
Kerosine do	102	16
Distillate fuel oil do	93	191
Residual fuel oil do	455	603
Lubricants do	r 221	213
Other:		
Liquefied petroleum gas do	r 772	867
White spirit do	28	22
Mineral jelly and wax do	164	121
Nonlubricating oils, n.e.s do	6	9
Asphalt and bitumen do	(1)	(1)
Bituminous mixtures, n.e.s do	(1)	1
Petroleum coke do	(1)	--
Unspecified do	r 2	4
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	716	738

r Revised. NA Not available.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Copper.—Production increased in 1975 as a result of the expansion program included in the 1973–77 5-year plan, but more than one-half had to be stockpiled. Output was up 9%, from 16,504 tons in 1974 to 17,970 tons in 1975. At the same time, prices plummeted from $2,877 per ton in 1974 to $1,222 per ton by yearend 1975. The total value of copper produced gained only 17%, from $6 million in 1974 to $7 million in 1975. Exports fell to 8,870 tons in 1975 from 19,019 tons in

1974. As with other minerals, the Government's policy was to maintain production and employment by stockpiling the excess output.

The new Ouansimi mine, opened in 1974, contributed 11,919 tons to the production total, up from 8,614 tons in 1974. Development of other elements of the expansion plan, which was designed to triple copper output by 1977, were postponed. These elements included new mines at Talat Nouame, Bini Mellal, and Bleida, washing plants at Ouansimi and Tazallaght, and a foundry at Safi.

Iron Ore.—Production of iron ore at the mine of BRPM's subsidiary Société d'Exploitation des Mines du Rif (SEFERIF) near Nador increased slightly during 1975. Output was 554,000 tons in 1975, up 4% from the 531,000 tons produced in 1974. Total value of iron ore production also increased slightly, from $13 million in 1974 to $14 million in 1975, a gain of 8%. Nearly one-half had to be stockpiled because exports fell to 301,000 tons, down 44% from the 538,000 tons shipped in 1974. Those stocks were not being held for future export, however, because they were slated for consumption in the $1 billion steel mill to be built near Nador. A call was issued by the Government for preselection of firms to bid on construction of the plant, and bids were expected to be taken beginning in August 1976. Plans called for the plant to begin operation in 1980 or 1981 and reach full capacity of 850,000 tons by 1985. A variety of steel shapes and products will be manufactured, all for domestic consumption. Raw material inputs for the plant will include the entire SEFERIF production along with imported iron ore. Coke or coking coal will also be imported, since reducing anthracite coal from the nearby Jerada mine to coke would involve higher costs. Plans to use a direct reduction process fueled by natural gas had been considered but were dropped in favor of a coke operation because of the possibility that the necessary natural gas supplies from Algeria would not be available. Ownership of the plant will be vested in Société Nationale de Sidérurgie (SONASID). Sources remained to be found to supply the major part of the financing for the mill.[4]

Lead.—The industrial recession also caused lead demand and prices to drop, and the production level in Morocco followed suit. Production declined 26% to 104,000 tons in 1975 from 141,000 tons in 1974, and the value of production slumped 34% to $25 million from $38 million in 1974. Exports were off 40%, from 126,000 tons in 1974 to 75,000 tons in 1975. Quantities shipped to major consuming countries fell by the greatest percent, exports to France were down 72%; to Tunisia, down 69%; to Spain, down 48%; and to Belgium-Luxembourg, down 36%. Reduced world prices and currency devaluations together caused a drop in value to producers of approximately 50%. High production costs forced the Aouli mine near Midelt to close. The foundry at Oued el Heimer reopened after completion of a modernization program, and Morocco was once again able to process its own ore, which had to be exported in concentrate form in 1972–74.

New facilities included a mine at Bediane, near Touissit, with a capacity of 50,000 tons per year when fully developed, a smelter under construction at Zaida, and the discovery of additional deposits by BRPM. BRPM continued its exploration work in the Upper Moulouya area.[5]

Manganese.—Manganese output fell victim to industrial recession in the same manner as other metals and slipped 25% to 131,000 tons in 1975 from 175,000 tons in 1974. Exports declined even more sharply, implying some degree of stockpiling. All production continued to be from the Imini mine operated jointly by BRPM and Société Anonyme Chérifienne de'Études Minières (SACEM). Availability of proven reserves of 1.5 million tons will enable a large increase in production to take place once market conditions improve.

Zinc.—Zinc fared somewhat better on world markets than many other metals in 1975. Exports in 1975 totaled 30,655 tons, down 17% from the 1974 level of 36,792 tons, although the value of exports slipped 25% to $6 million from $8 million in 1974. Production rose to 36,000 tons from 27,000 tons in 1974. However, reserves of zinc were reported to be nearing depletion. La Société des Mines de Zellidja was investigating a process for deriving

[4] U.S. Embassy, Rabat, Morocco. State Department Airgrams A-143, Dec. 30, 1975; A-55, May 26, 1976; and A-56, May 26, 1976.

[5] U.S. Embassy, Rabat, Morocco. State Department Airgram A-68, June 17, 1976, p. 6; and State Department Telegram 2396, May 1975, p. 2.

zinc oxide from a 15-million-ton mine dump at the Boubeker mine in the Touissit area.

Other Metals.—The Office Chérifien des Phosphates (OCP), Morocco's official phosphate monopoly, continued its investigation into the possibility of extracting uranium as a byproduct of phosphate rock processing. Given the country's deficiency in energy resources, such a development would be of significant value to the economy. Discussions on the technical and economic feasibility of such an operation were being held during the year with a U.S. company that has conducted research on this type of process.[6]

Morocco was seeking assistance from U.S. and European mining interests in exploring and developing the newly acquired mineral deposits in the Western Sahara. Investigations by the United Nations and others have indicated the presence of iron ore, uranium, vanadium, titanium, cobalt; and oil shale in the territory.[7]

NONMETALS

Fluorspar.—Production at the El Hamman mine, which began operation in 1974, increased considerably in 1975. Output totaled 47,000 tons, more than double the 19,000 tons produced in 1974. Total exports also were up strongly, rising to 29,000 tons from 5,500 tons in 1974. Production capacity of the mine was given as 80,000 tons of 50% ore and 60,000 tons of 98% ore annually. The reserve was estimated at 5 million tons.

Phosphate Rock.—A drastic weakening of phosphate demand resulting from a combination of factors forced OCP to retreat from its stated objective of maintaining the production and price levels set at the outset of 1975. Price resistance and stockpiling by consumers as a reaction to the unprecedented price increases of 1973–74, late spring rains in western Europe that delayed planting and reduced fertilizer use, and the balance of payments difficulties experienced by many countries as the result of soaring petroleum costs all combined to depress fertilizer demand, particularly in the western European market. At the same time, the $68-per-ton price level, which was set early in 1975, stimulated a rapid rise in competitive production and exports, particularly from the United States. Price discounting and production cutbacks inevitably followed, dropping Morocco's output 28% to 14.1 million tons in 1975. The average unit value was lowered from $52.36 per ton in 1974 to $42.61 per ton in 1975, and exports of phosphate rock and fertilizers were cut 30% to 13.2 million tons in 1975. Revenues earned by phosphate exports slipped to $884 million from $1,028 million and represented $12.5% of the gross national product in 1975 as compared with 15.0% in 1974.

Little change had occurred in the overall geographic distribution of phosphate rock sales as of 1974. Western Europe remained the major customer, taking 60% of the shipments, down slightly from 63% in 1973. Eastern Europe increased its share from 19% to 24%, and a smaller share went to the rest of the world, 16% in 1974 as compared with 18% in 1973.

It had been anticipated that depletion of consumer stockpiles and a general economic recovery would allow phosphate demand and prices to regain their former levels by 1977. However, continued unfavorable farming weather in western Europe and competing production caused the downtrend in prices to continue. As a result, postponements of some parts of OCP's expansion program were considered likely.

The drying facilities under construction in the Khouribga area were being completed to enable production to reach the 20-million-ton-per-year goal targeted for the late 1970's. Output from the Sidi Hajjaj mine, beginning in 1980 or 1981, was expected to supplement this amount by 5 million tons per year. In the Youssoufia area, the Ben Guerir 1 mine was under construction in 1974 and slated to produce 2.65 million tons annually by 1981. Contracts worth $20 million were signed to provide equipment for the Ben Guerir 2 mine, which was scheduled to begin producing in 1981 and to reach its 9.75-million-ton-per-year capacity in 1990.

The Maroc Phosphore II processing plant, which is to consume the output of the Ben Guerir 1 mine, was nearing completion at Safi. The plant will be able to convert 495,000 tons of phosphate rock

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[6] U.S. Embassy, Rabat, Morocco. State Department Airgram A-68, June 17, 1976, p. 9.

[7] Industrial Minerals. 10,000 M. tons of Phosphates? No. 103, April 1976, p. 13.

Engineering and Mining Journal. Morocco Seeks Exploration Knowhow for Sahara. V. 177, No. 5, May 1976, p. 47.

per year, contained P_2O_5 basis, into phosphoric acid and triple superphosphate. Planning was continued for its successors, Maroc Phosphore III and IV, but their time schedules were set back because of the current market weakness and the resulting loss of revenues. Maroc Phosphore III and IV processing plants are to be part of an industrial center planned for the new port of Jorf Lasfar, which will also include a petrochemical complex. The port and petrochemical complex will be a joint project with Abu Dhabi, which will supply oil for refining and petrochemicals production. Loan agreements were signed with Kuwait, West Germany, and the World Bank during the year to help finance the various phosphate processing projects. Lockwood Greene Co. and the Badger Corp. were among the U.S. companies that had won design contracts for the port and petrochemicals complex.

The phosphate processing facilities at Jorf Lasfar will have a combined capacity of 2.9 million tons per year, P_2O_5 basis, and will handle the output of the Sidi Hajjaj and Ben Guerir mines. By 1985 Morocco expects to be capable of mining over 40 million tons per year of phosphate rock and plans to process about 30% of its output into higher valued manufactured products. In order to have a phosphoric acid shipping capacity, OCP, Compagnie Marociane de Navigation (COMANAV), and Gazocean S.A. of France formed an ocean shipping company, Marphocean, and ordered four 10,500-deadweight-ton vessels, which were being constructed at Le Havre, France. One vessel was received in early 1975, and the other three were scheduled to begin operation in 1977–78.[8]

The U.S.S.R. participation in the development of the Meskala deposit was postponed indefinitely by OCP. Soviet mining equipment and technology were to be provided in return for phosphate shipments of up to 10 million tons per year in a deal having an estimated value of $1 billion. However, one door had no sooner shut when another opened. Plans for a joint venture with Spain, a major phosphate customer, were under study at yearend.

The year's major event was Morocco's annexation of the Western Sahara. The territory contains a rich phosphate deposit at Bu Craa with an estimated 10-billion-ton reserve of ore averaging 31% to 33% P_2O_5. Negotiations with the Spanish company that was developing the mine, Fosfatos de Bu-Craa S.A., resulted in a joint venture of the same name in which Morocco holds a 65% interest and Spain a 35% interest. Former mine personnel were retained. Damage to the conveyor belt that carries the ore from the mine to the port at El Aaiun, a distance of 62 miles, caused production to be halted temporarily. Operation was later resumed with a fleet of trucks hauling the ore. Output was expected to total approximately 4.5 million tons in 1976. OCP planned to increase the mine's capacity to 10 million tons per year by expansion of the open pit operation and the construction of additional washing units. Long-range plans announced by OCP included a phosphoric acid plant and a fertilizer plant at El Aaiun.[9]

Salt.—Production from existing salt mines increased from 36,000 tons in 1974 to 60,000 tons in 1975.

A rock salt mine was under development in the Berrechid Basin near Mohammedia. The salt deposit, which was discovered during an exploration program for potash, covers an area of approximately 15 square kilometers with an average thickness of 80 meters. The total reserve was estimated at 3 billion tons, and the bottom 7 meters has an average grade of 99% NaCl. Mine output was projected at 900,000 tons of salt per year.

A chemical complex based on the salt mine was under development concurrently. The complex includes three plants. One is to produce 25,000 tons per year of chlorine and 28,000 tons per year of caustic soda. A second is to produce 25,000 tons per year of polyvinyl chloride, using the chlorine along with ethylene as inputs. The third plant is to manufacture 500,000 tons per year of soda ash. The manufactured products are to supply the requirements of domestic industry and provide export earnings, and salt will be produced

[8] U.S. Embassy, Rabat, Morocco. State Department Airgrams A–23, Feb. 28, 1975, pp. 4–5; A–85, July 9, 1975, p. 4; A–13, Jan. 28, 1976, p. 5; A–68, June 17, 1976, pp. 4–5.
Chemical Week. Angling for Phosphates. V. 117, No. 21, Nov. 19, 1975, pp. 14–15.
British Sulphur Corp., Ltd. Morocco Plans for the Future. Purley Press, London, 1975, p. 11.

[9] Engineering and Mining Journal. Morocco Shelves Pact for Soviet Mining Aid for Meskalas Phosphate. V. 177, No. 1, January 1976, p. 41.
Chemical Week. Spain Wants Role in Moroccan Phosphates. V. 118, No. 18, May 5, 1976, p. 29.
Works cited in footnote 7.

for the domestic market. A Moroccan company, Société Nationale d'Electrolyse et de Petrochemic, is to manage the operation. Contracts totaling about $170 million were signed with French, Spanish, and Italian companies for construction of the mine and plants. Mining is to begin in 1976, and completion of the project is scheduled for 1977.[10]

Other Nonmetals.—Pyrrhotite production at the Kettara mine was expected to terminate as soon as arrangements could be made to absorb the displaced workers. The mine produced a high-sulfur-content pyrrhotite used to produce sulfuric acid for the Maroc Chimie fertilizer plant. Reduced world sulfur prices have made imported sulfur a less expensive source of acid than pyrrhotite. Production fell to 204,000 tons in 1975 from 509,000 tons in 1974.

Recent increases in world potassium prices have reawakened interest in low-grade deposits located near Khemisset. BRPM commissioned a feasibility study to determine the economic and technical conditions under which mining could take place.[11]

MINERAL FUELS

Coal.—Coal production at the Jerada mine rose 14% to 652,000 tons in 1975 from 574,000 tons in 1974. Exports of coal slipped to 19,000 tons in 1975 from 34,000 tons in 1974, but higher prices held the decline in value to a more modest 18%, from $1.7 million in 1974 to $1.4 million in 1975.

Work continued during the year on a modernization program at the Jerada mine that is expected to increase the production to 830,000 tons annually. Included in the program were a new gallery, a new crushing and screening station, and a new conveyor system. Much of the additional production is slated for export, to offset part of the cost of imported coal for the Nador steel mill. Coal from the Jerada mine will not be used at Nador because its cost exceeds that of imported coking coal. Jerada coal will also continue to fuel the adjacent powerplant and cement and sugar industries and to provide home heating.

A deposit of lignite was discovered in the Sais Basin southwest of Fez. The Government released no details concerning its size, grade, or production prospects.[12]

Natural Gas.—Production from the Essaouira and Gharb gasfields increased 20% in 1975 compared with 1974 output. A natural gas pipeline from the Gharb fields to Kenitra presumably was completed in 1975 as scheduled, although confirmation of its completion was not received. Completion of the pipeline would allow the exploitation of new fields in the Gharb to tap a reserve estimated at 750 million cubic meters. However, these relatively small reserves, along with a diminished prospect of importing natural gas from Algeria, did not permit that fuel to figure highly in Morocco's future energy plans.

Oil Shale.—Research continued in an attempt to find an economically feasible method for exploiting the country's extensive oil shale resources. The two major deposits at Timahdit and Tarfaya constitute Morocco's only known sizable domestic source of petroleum, and the effort to develop them was given high priority by the Government. The Timahdit deposit was estimated at 5 billion to 7 billion tons of rock containing 10% oil, while reserve estimates at Tarfaya had not been given. Geological studies of the two sites were being conducted by BRPM, and ore samples from Timahdit were being tested in Europe and the United States. A Moroccan team visited the United States and Brazil, both of which have similar oil shale deposits, and concluded that essentially the same technical approach had been adopted in both countries. A contract was signed with the Oil Shale Corp. (TOSCO) of the United States for experimental processing of shale samples at TOSCO's Colorado pilot plant. A mission of 12 Soviet oil shale experts visited Morocco to discuss cooperative research, but the results of those meetings had not been announced.[13]

Petroleum.—Output of the oilfields operated by Société Chérifienne des Pétroles (SCP) declined in 1975, totaling 306,000 barrels in 1975 as compared with 191,000 barrels in 1974. Crude oil imports were up slightly to 19.6 million barrels from 19.2 million barrels in 1974, but their total

[10] Industrial Minerals. Rock Salt Mine and Chemical Fixing. No. 95, August 1975, pp. 10–11.
U.S. Embassy, Rabat, Morocco. State Department Airgrams A–85, July 9, 1975, p. 8 and A–68, June 17, 1976, p. 8.
[11] Work cited in footnote 6.
[12] Work cited in footnote 6.
[13] Work cited in footnote 6.
U.S. Embassy, Rabat, Morocco. State Department Airgram A–13, Jan. 28, 1976, p. 2.

value dropped a small amount, from $241 million in 1974 to $224 million in 1975.

A petroleum discovery was announced by BRPM near Essaouira in 1975, but no information on its size or quality had been given by yearend. Interest in the area was stimulated, however, and exploration teams continued to work there. Also, BRPM was engaged in a series of basic geologic studies in search of petroleum covering two-thirds of the country.

Exploration for petroleum was in progress off most sections of Morocco's coast. Concessions granted to Burmah Oil Co., Ltd., Sun Oil Co., and a combine of EXXON and Shell Oil Co. blanketed most of the Atlantic coast of Morocco, while Tidelands Oil Co. held a concession covering an area in the Atlantic farther offshore. Other concessions granted to Tidelands, Shell, and a combine headed by Chevron (Standard Oil Co. of California) covered various portions of Mediterranean water. A new concession agreement for a deep water Atlantic area was signed with a consortium consisting of Phillips Petroleum Co., Agip S.p.A. and Getty Oil Co.

The pace of offshore exploration picked up in 1975, but no successes were reported. Sun drilled one well off Sidi Ifni and had plans for another. Tidelands completed a seismic research project in its deep water Mediterranean concession and was carrying out another in its Atlantic area. Two of the companies holding concessions in the Mediterranean were expecting to drill in 1976 or 1977. However, unsuccessful drilling caused Burmah to close down operations in its area, which lies offshore between Tangier and Rabat.

Société Anonyme Marocaine-Italienne de Raffinage (SAMIR), the larger of Morocco's two oil refining companies, announced a $200 million project involving expansion of its refinery at Mohammedia and the addition of a small complex of plants to manufacture lubricating oil and fertilizer. Petrofrance, a subsidiary of United Oil Products, is consultant on the project. The project had been under consideration for several years, but domestic demand had previously been too small to justify it. Refinery capacity was to be enlarged from 2.5 million to 5.7 million tons per year (approximately 18 million to 42 million barrels per year). This expansion was to give the country a total refinery capacity of about 7.3 million tons (54 million barrels) per year.

Other parts of the complex included a 100,000-ton-per-day ammonia plant and a 200-ton-per-day urea plant. The two plants would be owned by a new company, Nitromar, a joint venture of SAMIR, U.S., and Swiss interests. Auxiliary facilities were to include a new pier at the harbor in Mohammedia to improve handling for vessels up to 100,000 deadweight tons and a crude oil pipeline to the country's other refinery at Sidi Kacem (both refineries are wholly or partly Government-owned).

The complex, which will be the first of its kind in Morocco, is scheduled for completion in 1977. It will serve the domestic market and will consume excess naphtha and fuel oil from the refinery. Still under consideration is an ethylene plant that would consume propane to make butane, a product in growing domestic demand.[14]

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[14] U.S. Embassy, Rabat, Morocco. State Department Airgrams A-23, Feb. 28, 1975, p. 6; A-85, July 9, 1975, p. 9; A-13, Jan. 28, 1976, p. 4; A-56, May 26, 1976, p. 3; A-68, June 17, 1976, p. 10.
U.S. Consulate, Casablanca, Morocco. State Department Airgram A-13, Mar. 19, 1976.
Oil and Gas Journal. International Briefs. V. 74, No. 21, May 24, 1976, p. 53.
European Chemical News. Morocco Outlines Major Chemical Expansion Plans. V. 27, No. 709, Oct. 31, 1975, p. 33.

The Mineral Industry of Mozambique

By David E. Morse [1]

The mineral industry of Mozambique was a minor contributor to the economy of the country in 1975. Production remained at about the 1974 level which was down compared with that of 1973. Coal production increased 34% and was the only mineral commodity to show a significant increase during the year. Output of cement fell nearly 31% and limestone production was down over 12%. Tantalite production was estimated to be in the order of 40 tons. Petroleum refinery output was estimated to be at 50% of capacity due to the exodus of technicians and reduced imports caused by lack of foreign exchange.

Prospecting and mine output were temporarily affected by the political changes that took place in Mozambique in 1975. The country began the year under a transition Government and gained independence from Portugal on June 25, 1975. The incoming Government immediately claimed ownership of all mineral rights and to all the land in the country. During the tenure of the transition Government a large portion of the trained administrators and technicians exited the country which left a vacuum in several areas of the economy that was not easily filled by local people.

The estimated government budget was $524 million in 1975 and the gross domestic product (GDP) was estimated at $3.1 billion.[2] Mozambique's external debt was expected to be over $650 million and the balance of payments deficit about $60 million in 1975.

Prior to 1975, Mozambique's system of railroads, roads and harbors contributed significantly to the country's foreign exchange earnings as a large volume of import-export traffic generated in Zambia, Rhodesia, Republic of South Africa, Swaziland, and Malawi passed through the major Mozambique ports of Maputo (formerly Lourenço Marques), Beira, and Nacala. During 1975, South African traffic through Mozambique dropped nearly 60% after independence as part of the exports normally handled at Maputo were shipped via Durban or other South African ports. Delays and loss of trained dock workers at Maputo prompted South African shippers to seek other routes for their exports. Traffic through Mozambique from Rhodesia and Swaziland also decreased but to a lesser degree. The total tonnage handled at Maputo was about 10.9 million tons in 1975, an 18% decrease compared with 1974 tonnage and 23% below that of 1973. The port of Beira on the central coast handled over 3 million tons in 1975, a 1% increase over 1973 tonnage and 3% above that of 1974. The port of Nacala which could handle the largest vessels but was the least accessable of the three major ports in terms of land transportation because of its position in the north, handled 758,000 tons in 1975, a 6% drop from the 1974 tonnage and 5% below that of 1973.

Upgrading of the ports of Maputo and Beira continued in 1975. Maputo received new loading and railway equipment and began preliminary work on the Porta Dobela facility. Plans for Porta Dobela included dry bulk storage space for 1.2 million tons, liquid storage of 800,000 tons, and facilities to offload crude oil to an inland tank farm. Improvements at Beira included dredging of the access channel and construction of a new wharf.

Improvements of the rail system between Moatize in the Tete District and Beira were designed to accommodate planned

[1] Physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from Mozambique escudos (M. Esc) to U.S. dollars at the rate M.Esc1=US$0.0367589.

increases in coal exports from Tete's coal basins as well as Zambian copper. The road system from Moatize to Zambia was improved with a section Tarmaced so that Zambian shipments could be effectively transported to the improved railyard at Moatize. These shipments were generally routed to the port of Nacala rather than to Beira because Nacala has facilities for larger vessels. Impounding of water by the Cabora Bassa dam began in December 1974 and it was expected to take about 2 years for the reservoir to fill. The reservoir would allow navigation on the upper Zambezi River in Mozambique so that waterborne ore shipments from areas in western Tete could be easily shipped to the rail connection at Moatize.

A stock company, Hidro-Electrica de Cahora Bassa S.A.R.L., was formed in June 1975 to operate the Cabora Bassa hydroelectric complex. Major subscribers were Soc. Fin. Portugesa, State of Portugal, State of Mozambique, Banco de Formento Nacional, and Coxia Gerl de Deps. Complete division of stock was not known, but the organization of the company was such that the State of Mozambique would eventually acquire the company and its holdings. The Cabora Bassa hydroelectric complex began power production from 450-megawatt generators in the south power station early in 1975. When the complex is completed, its total output was expected to be 3,600 megawatts, making it the largest hydroelectric producer in Africa. The Republic of South Africa had contracted to use 1,470 megawatts of the dam's production by yearend 1979.

An estimated 100,000 Mozambique nationals were working in South African mines in 1975 and generated about $120 million in foreign exchange earnings for the Mozambique Government. Another 85,000 nationals were estimated to be working in Rhodesia and Zambia, half in mining-related activities.

PRODUCTION AND TRADE

The available data on mineral production and trade are given in the following tables:

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

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum, bauxite, gross weight	[r] 5,594	2,405	[e] 2,000
Beryllium, beryl concentrate, gross weight	[r] 6	8	[e] 10
Bismuth, mine output, metal content ---- kilograms	[r] 3,844	[e] 4,000	[e] 4,000
Columbium and tantalum, ore and concentrate, gross weight:			
Microlite	[r] 54	53	[e] 53
Tantalite	[r] 31	40	[e] 40
Copper, mine output of salable ore and concentrate:			
Gross weight	1,629	2,498	3,146
Metal content	407	624	787
Gold ---- troy ounces	[r] 13	[e] 20	[e] 20
Tungsten, mine output, metal content (scheelite)	1	[e] 2	[e] 2
NONMETALS			
Abrasives, natural, unspecified	241	435	NA
Asbestos	[r] 232	[e] 433	[e] 281
Cement, hydraulic ---- thousand tons	611	465	[e] 300
Clays:			
Bentonite (including montmorillonite)	[r] 4,421	4,700	[e] 6,100
Kaolin (including china clay):			
Crude	472	475	454
Washed	[r] 100	171	[e] 150
Marl	37,447	NA	NA
Other	26,320	NA	NA
Feldspar	830	840	[e] 850
Fertilizer materials, manufactured all types	51,553	26,064	NA
Gem and ornamental stones:			
Amazonite ---- kilograms	2,000	4,200	NA
Aquamarine ---- do	NA	4	NA
Beryl crystals ---- do	[r] 837	55	[e] 14

See footnotes at end of table.

Table 1.—Mozambique: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
NONMETALS—Continued			
Gem and ornamental stones—Continued			
Garnet ---- kilograms	17,000	14,426	NA
Morganite ---- do	NA	16	NA
Obsidian ---- do	[r] 91,000	190,100	NA
Topaz ---- do	NA	16,000	NA
Tourmaline ---- do	[r] 1,472	4,248	NA
Lime (hydraulic)	9,664	4,539	[e] 2,200
Lithium minerals:			
Lepidolite	--	730	[e] 730
Spodumene	--	25	[e] 25
Mica, mainly scrap	310	852	900
Salt:			
Marine	52,924	27,680	[e] 30,000
Rock [e]	20	20	20
Stone and sand:			
Limestone ---- thousand tons	[r] 1,024	682	[e] 600
Granite and other quarry stone ---- do	[r] 996	[e] 490	[e] 120
Sand ---- do	791	NA	NA
Sulfur, sulfuric acid	40,962	23,352	NA
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous ---- thousand tons	394	426	575
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	1,020	601	[e] 500
Kerosine ---- do	171	127	[e] 200
Jet fuel ---- do	307	68	[e] 60
Distillate fuel oil ---- do	1,242	947	[e] 700
Residual fuel oil ---- do	2,242	1,607	[e] 1,100
Other:			
Liquefied petroleum gas ---- do	177	94	[e] 80
Asphalt ---- do	241	80	[e] 100
Refinery fuel and losses ---- do	648	388	[e] 260
Total ---- do	6,048	3,912	[e] 3,000

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

[1] In addition to the commodities listed, other crude mineral commodities may be produced, particularly for local use, but data is not available and information is inadequate to make reliable estimates of output levels.

Table 2.—Mozambique: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Beryllium ore and concentrate	22	3
Columbium and tantalum minerals	124	192
Copper metal including alloys	646	69
Iron and steel:		
Scrap	8,334	9,767
Semimanufactures	[r] 5,218	1,525
NONMETALS		
Asbestos	383	424
Cement	--	49,707
Clays and clay products:		
Crude clays, bentonite	2,865	4,327
Nonrefractory, bricks	9	6,917
Fertilizers, nitrogenous	18,853	2,437
Gem stones, except diamond ---- kilograms	21,400	11,000
Salt	4,371	5,125
Stone, dimension	--	396
Sulfuric acid	--	3,478
MINERAL FUELS AND RELATED MATERIALS		
Coal	49,523	98,112
Petroleum refinery products:		
Gasoline ---- thousand 42-gallon barrels	317	152
Jet fuel and kerosine ---- do	147	82
Distillate fuel oil ---- do	541	269
Residual fuel oil ---- do	1,832	1,070
Lubricants ---- do	1	1
Other:		
Liquefied petroleum gas ---- do	46	--
Asphalt, bitumen, and petroleum coke ---- do	107	--

[r] Revised.

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

Commodity	1973	1974
METALS		
Aluminum metal including alloys, all forms	898	903
Copper metal including alloys, all forms	493	2,427
Iron and steel semimanufactures	104,150	71,927
NONMETALS		
Cement, hydraulic	11,647	23,221
Clays and clay products:		
Refractory	3,687	3,002
Nonrefractory	4,978	2,894
Fertilizer materials, manufactured	23,172	12,737
Gypsum	22,715	15,390
Sodium and potassium compounds, caustic soda	4,939	5,043
Sulfur, elemental, all forms	20,322	19,092
MINERAL FUELS AND RELATED MATERIALS		
Coal, anthracite and bituminous	243,118	235,435
Petroleum:		
Crude ... thousand 42-gallon barrels	5,939	1,909
Refinery products:		
Gasoline ... do	129	90
Kerosine ... do	151	72
Jet fuel, distillate fuel oil, and residual fuel oil ... do	952	1,178
Lubricants ... do	92	65
Bitumen and petroleum coke ... do	9	--

COMMODITY REVIEW

METALS

Bauxite.—The Alumen mine near Manica in the Villa Perry District continued to produce slightly over 2,000 tons per year with an average grade of about 62% Al_2O_3. Reserves of the deposit were reported to be over 60 million tons averaging 44% Al_2O_3. Other known bauxite deposits occurred in the Zambézia District at Milange and south of Lake Chirua near Malawi's eastern border. The extent and grade of these deposits were being studied during the year.

Copper.—The only copper mine in Mozambique was the Edmundian Mine located in the Manica area of Villa Perry near the Rhodesian border. The mine's 1975 production of copper ore and concentrate was valued at about $400,000. This was a 60% drop from 1974 due to reduced exports, lower world copper prices, and the restricting of the mine's activities to prospecting and evaluation of the ore body. Copper deposits had been found in the Tete District near Camitala, Concia, Chidua, Luzina, Mepanda-Unkua, and Tumba. The Chidua deposit had been studied in detail and was considered for possible economic development.

Gold.—The Bragana and Monque gold mines in the Manica area were reported as being reopened. The director of the Mozambique Bureau of Mines pointed out that gold bearing terrain had been located in other parts of the country but remained unworked because of internal civil disorder.

Iron.—There were numerous occurrences of iron-bearing mineral deposits in Mozambique, according to the Mozambique Geological Services report in 1974.[3]

Titano-magnetite deposits which occur in the Precambrian gabbro anorthosite crystalline complex of the Tete District, were known at Caldas Xavier, Doa, Inhantipissa, Machidua, Massamba and Txizita. The chemical composition of the ore varied little between localities and generally contained 47% Fe and 13% TiO_2 with the rest consisting of silicate minerals. Known reserves at Massamba were 4.5 million tons; at Inhantipissa, 3 million tons; and at Caldas Xavier, 2 million tons. The deposit at Doa was estimated to contain reserves of 18 million tons.

Iron-bearing deposits that occurred in Precambrian limestones near Fingoa were estimated to have reserves of over 10.5 million tons containing an average of 65% Fe.

[3] 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, 60 pp.

Sedimentary deposits included banded ironstones of the Macaqueca formation in the Villa Perry District and taconites in the Tete, Zambézia and Moçambique Districts. Reserves were estimated to be over 20 million tons containing an average of 30% Fe.

Information was not available as to the progress of construction on the steel mills at Tete and Beira. Construction on the foundry at Nampula began in 1975 before the change in Government.

Titanium.—Dense mineral layers were contained in the coastal beach dunes between Maganja de Costa and Moma along the north central coast. These layers comprised up to 30% of total dune material and had an average composition of 78% ilmenite, 13% zircon, 5% monazite, 2% rutile, and minor amounts of quartz, and garnet. The destruction of the coastal dunes by the sea during high energy events had resulted in effecting the removal of these denser layers in some coastal areas. During low energy conditions reconstruction of the beach had preferentially used the less dense materials, leaving the more dense materials in underwater deposits. Deposits of this nature were found during 1973 by the West German Preussag Exploration group in 30 meters of water near Pebane. Dense minerals comprised 70% to 80% of the material in these underwater concentrations. The known underwater deposits were estimated to contain 30 million tons of ilmenite, 3 million tons of zircon, and 2 million tons of rutile. Preussag applied for concessionary rights to prospect and exploit these deposits in the Pebane area.

NONMETALS

Cement.—The total annual capacity of Mozambique's three major cement plants at Matola, Dondo, and Nacala was 990,000 tons. The plants were all controlled by Companhia de Cementos de Moçambique, S.A.R.L. Production for 1975 was estimated to be in the order of 300,000 tons which was short of the 1973 record of 611,000 tons. Problems including loss of technicians, inadequate regular supplies of limestone and coal, lack of spare parts, and decreased worker productivity were cited as causing the marked decrease in production. Planned expansion to produce 1.89 million tons of cement annually remained uncertain due to the change in Government.

Clays.—Kaolin from the Tete deposits replaced imported Brazilian kaolin at the Maputo ceramics factory. Montmorillonitic clay production increased 25% over that of 1974. Large montmorillonite deposits existed in the Lourenço Marques District between Namaacha and Maputo and exceeded 15 million tons in resources.

Fluorite.—Fluorite deposits occurred in several areas, notably Djanguire and Lupata in the Tete District and at Canxine and Dejarlie in the Villa Perry District. The Djanguire deposit had an estimated 600,000 tons of 62% average grade fluorite. Total reserves of lower grade, 16% to 26% fluorite, were estimated at 60 million tons.

Other Minerals.—In the pegmatite areas of Zambézia, Niassa, and Moçambique the small-scale mines produced beryl (aquamarine and emerald), tourmaline, topaz, amazonite, morganite, rose quartz, rare kunsite and hiddenite crystals, and colombotantalite ore. Quality garnets were mined in the Nova Freixo area of the Niassa District.

MINERAL FUELS

Coal.—Companhia Carbonifera de Moçambique S.A.R.L. (CCM), the only company mining coal in Mozambique, produced over 575,000 tons of bituminous coal in 1975. CCM's production came from its Moatize mine which was part of a concession area of about 31 square kilometers in the Moatize-Minjova Basin. The mine was located about 30 kilometers east of Tete and had a proven reserve of over 400 million tons of coal. Expansion was planned for the Moatize mine to produce 4 million tons annually in the early 1980's with 1 million tons projected for the 1978 output. These expansion plans included using power generated by the Cabora Bassa hydroelectric complex for a system of electric trains in the underground and open pit operations. Most of the expanded capacity was to be exported through the ports of Beira and Nacala to Portugal, West Germany, and Japan. About 60% of the coal produced at the Moatize Mine was of coking coal quality.

The Zambezi valley contained other large coal deposits notably those near Chicoa and near Muncanha. The Tete

District was expected to produce 8 million tons of coal per year for export when expansion and development is completed in the early 1980's. Coal deposits found in the Niassa District near Manicamba and in the Catur area were being evaluated for possible development. Coal deposits also occurred near Macio southwest of Espungabera close to the Rhodesian border in the Villa Perry District.

Petroleum and Natural Gas.—Natural gasfields at Temane and Pande in the Inhambane District and at Buzi in the Beira District were estimated to contain 121 billion cubic meters of gas but were not being exploited in 1975. The Government proposed a petrochemical complex for the manufacture of synthetic fertilizer and synthetic gasoline using the natural gas from the Pande Field. Hunt International Petroleum held the only exploration permit for petroleum in an offshore concession near Pande at the beginning of 1975. Interest in petroleum exploration was expressed by other oil companies but uncertainties remained in the Government's policies concerning the granting of concessions. An estimated 3 million barrels of crude oil was imported for the Maputo oil refinery in 1975. Almost all of the oil refinery's production was consumed domestically in 1975.

The Mineral Industry of the Netherlands

By William F. Keyes [1]

The worst postwar recession in the Netherlands' economy reached its low point in July 1975, but by yearend there were signs of recovery. Gross national product (GNP) at constant prices declined 2%, although it rose from \$74 billion to \$80 billion [2] at current prices; the index of industrial production declined from 121 in 1974 to 115 in 1975 (1970=100); and the unemployment rate rose from 4% to 5.4% during the course of the year. Added to usual cyclical problems was the heavy burden that government expenditures continued to place on the private sector. Public expenditures as a share of the gross domestic product (GDP) were the highest in the Organization for Economic Cooperation and Development (OECD), and they took more than 50% of the wage earner's income. Business conditions in the major minerals industries of the Netherlands generally followed the economy.

By world standards the only important primary mineral produced in the Netherlands was natural gas—about 6% of the world total. Nonmetallic minerals, such as building materials, are only locally important. The country is, however, a moderately important processor of imported ores and concentrates. It produced about 1.6% of the world's primary aluminum metal from imported alumina and almost 1% each of the world's pig iron and steel.

The year 1975 saw the announcement of forthcoming expansion at one of the country's two aluminum smelters; application for a concession for solution mining of magnesium and potash; and discovery of additional natural gas reserves.

Natural gas production and exports continued to increase, as the Netherlands remained the leading supplier of this product to other European countries. Abandonment of the coal industry in 1974 left unemployment high in the southeast. Demand for petroleum continued low, and refineries operated at not much more than one-half their capacity.

PRODUCTION

Production of virtually all primary minerals and metals declined in the Netherlands in 1975, but the declines were in general modest. Exceptions were petroleum products which were down to not much more than half of refinery capacity and natural gas production which continued to grow strongly on the basis of large proven onshore and offshore reserves. Pig iron, crude steel, lead, salt, and sand production declined, but new zinc capacity led to a significant increase in production of that commodity in 1975.

[1] Supervisory physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from the Netherlands guilders (Hfl) to U.S. dollars at the rate of Hfl2.53=US\$1.00, the annual exchange rate for 1975.

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

Commodity [1]	1973	1974	1975 p
METALS			
Aluminum metal, primary	190,018	251,711	260,833
Cadmium metal e	31	r 95	96
Iron and steel:			
Sintered ore (from imported ore) thousand tons	3,426	3,280	2,842
Pig iron including blast furnace ferroalloys do	4,707	4,804	3,970
Crude steel do	5,624	5,840	4,823
Semimanufactures do	5,103	5,169	4,051
Lead metal, primary	25,256	26,410	23,940
Zinc metal, primary	30,500	78,169	123,942
NONMETALS			
Cement thousand tons	4,077	4,088	3,706
Fertilizer materials, manufactured:			
Nitrogenous, nitrogen content do	1,112	1,160	1,214
Phosphatic, phosphorus pentoxide content do	302	346	259
Salt, all types do	3,044	3,387	2,690
Sand, industrial do	24,600	23,514	21,600
Sulfur:			
Elemental, byproduct do	54	55	56
Sulfuric acid (100% H_2SO_4) do	531	657	484
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	99,400	101,000	79,600
Coal, anthracite and bituminous thousand tons	1,722	758	--
Coke do	2,655	2,687	2,680
Fuel briquets, all grades do	250	--	--
Gas:			
Manufactured, all types [2] million cubic feet	101,441	104,890	89,255
Natural:			
Gross production do	2,501,467	2,956,707	3,208,428
Marketed do	2,494,687	2,949,750	3,193,278
Petroleum:			
Crude oil thousand 42-gallon barrels	10,169	10,227	9,676
Refinery products:			
Gasoline:			
Motor do	1,558	1,593	1,157
Aviation do	48,918	48,416	54,774
Jet fuel do	27,912	23,264	21,952
Kerosine do	9,447	5,929	4,611
Distillate fuel oil do	153,370	129,595	120,375
Residual fuel oil do	180,886	154,319	132,088
Lubricants do	3,290	4,032	2,786
Bitumen do	5,490	6,078	6,193
Liquefied petroleum gas do	11,206	9,582	10,428
Other do	68,096	65,927	44,270
Refinery fuel and losses do	34,274	30,176	24,355
Total do	544,447	478,911	422,989

e Estimate. p Preliminary. r Revised.
[1] In addition to the commodities listed, the Netherlands presumably produces a variety of crude construction materials (clays, sand, gravel, and stone), 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 Netherlands imported alumina, iron ore, and zinc concentrates for processing. Other imports were usually in a more advanced state of processing or were ready for consumption. Coal and coke were imported from the United States and West Germany, and crude petroleum for the Netherlands refineries was imported from the Middle East. Exports of primary forms and semimanufactures of steel were significant, as well as nonmetallics such as sand and gravel. The market for the Netherlands minerals and metals exports consisted primarily of nearby members of the European Economic Community (EEC), especially West Germany.

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

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite	4,610	4,521	West Germany 4,038.
Oxide and hydroxide	22,465	27,413	West Germany 7,022; Japan 5,108; Italy 5,040.
Metal including alloys:			
Scrap	30,664	37,925	West Germany 18,953; Belgium-Luxembourg 10,147.
Unwrought	193,664	293,982	Belgium-Luxembourg 101,085; France 78,100.
Semimanufactures	74,142	79,692	West Germany 26,934; Belgium-Luxembourg 19,992.
Antimony metal including alloys, all forms	61	38	France 20.
Bismuth metal including alloys, all forms	30	47	France 21; West Germany 9.
Cadmium metal including alloys, all forms	74	98	United Kingdom 27; Belgium-Luxembourg 24.
Chromium:			
Chromite	7,617	35,035	West Germany 14,891; France 9,873.
Oxide and hydroxide	573	150	France 45; West Germany 34; United Kingdom 25.
Cobalt:			
Oxide and hydroxide	23	10	West Germany 5; Australia 4.
Metal including alloys, all forms	155	142	Sweden 79; West Germany 24; Japan 19.
Columbium and tantalum: Tantalum including alloys, all forms	10	2	United States 1.
Copper metal including alloys:			
Scrap	42,109	37,514	West Germany 17,196; Belgium-Luxembourg 13,353.
Unwrought	12,551	22,584	United States 8,387; France 6,780.
Semimanufactures	33,182	33,318	West Germany 10,560; United States 4,867.
Germanium metal including alloys, all forms	7	1	All to Belgium-Luxembourg.
Gold [1] thousand troy ounces	332	428	France 238; Switzerland 127.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	497	196	West Germany 191.
Metal:			
Scrap do	1,122	1,374	West Germany 1,025; Belgium-Luxembourg 200.
Pig iron and ferroalloys [2] do	171	64	West Germany 38; People's Republic of China 23.
Steel, primary forms do	1,765	1,733	West Germany 519; Belgium-Luxembourg 481; Italy 167.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	609	721	Belgium-Luxembourg 144; West Germany 119; United Kingdom 116.
Universals, plates, sheets do	1,781	1,900	United Kingdom 378; United States 327; Belgium-Luxembourg 200.
Hoop and strip do	186	163	West Germany 101.
Rails and accessories do	45	45	West Germany 17; Italy 15.
Wire do	42	45	France 12; West Germany 12.
Tubes, pipes, fittings do	395	652	West Germany 416.
Castings and forgings do	8	9	West Germany 8.
Lead:			
Oxides	673	210	Hungary 100.
Metal:			
Scrap	19,565	21,602	France 10,015; West Germany 7,116.
Unwrought	25,272	20,376	West Germany 9,383; Poland 5,039.
Semimanufactures	2,611	2,389	Norway 604; Belgium-Luxembourg 590.
Magnesium metal including alloys:			
Scrap	1,183	1,495	United States 802; Belgium-Luxembourg 372.
Unwrought and semimanufactures	1,526	1,982	NA.
Manganese:			
Ore and concentrate	35,247	33,553	West Germany 8,378; France 3,634.
Oxide	141	94	Italy 24; United States 18; Malaysia 18.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Mercury ____ 76-pound flasks __	r 185	152	United Kingdom 29; Malaysia 29; Brazil 29.
Molybdenum metal including alloys, all forms ____	119	75	United States 15; France 10; Belgium-Luxembourg 10.
Nickel:			
Matte, speiss, similar materials ____	458	642	West Germany 594.
Oxide and hydroxide ____	601	364	West Germany 262.
Metal including alloys:			
Scrap ____	1,667	1,835	West Germany 908; United Kingdom 411.
Unwrought and semimanufactures ____	12,089	10,915	Sweden 5,331; Romania 1,252.
Platinum-group metals, all forms troy ounces __	26,814	27,971	Italy 8,745; France 7,202; Hong Kong 5,691.
Selenium, elemental ____	6	7	West Germany 6.
Silver metal including alloys, all forms thousand troy ounces __	4,513	4,477	West Germany 1,182; Italy 380.
Tellurium, elemental, arsenic ____	16	16	Italy 8; United Kingdom 4.
Tin:			
Oxide ____	29	94	West Germany 78; France 10.
Metal including alloys:			
Scrap ____	551	629	United Kingdom 250; West Germany 167.
Unwrought ____	1,592	1,707	United Kingdom 392; West Germany 388.
Semimanufactures ____	524	458	West Germany 155; Belgium-Luxembourg 111.
Titanium dioxide ____	26,323	22,580	West Germany 7,119; Italy 3,664; Belgium-Luxembourg 3,392.
Tungsten:			
Ore and concentrate ____	560	939	Czechoslovakia 247; U.S.S.R. 155; Poland 145.
Metal including alloys, all forms ____	168	295	Belgium-Luxembourg 191.
Zinc:			
Ore and concentrate ____	23,747	57,985	Belgium-Luxembourg 42,268; West Germany 10,705.
Oxide ____	15,103	12,139	West Germany 2,230; Belgium-Luxembourg 1,633.
Metal including alloys:			
Scrap ____	11,238	12,233	France 8,957; Belgium-Luxembourg 2,338.
Dust (blue powder) ____	1,073	1,106	NA.
Unwrought ____	39,663	68,003	United Kingdom 32,397; France 12,061; West Germany 9,200.
Semimanufactures ____	1,618	608	West Germany 262; Belgium-Luxembourg 130.
Other:			
Ore and concentrate ____	25,953	53,354	West Germany 16,300; France 8,148; Italy 5,712.
Base metals including alloys, all forms, n.e.s ____	228	1,129	West Germany 763.
Ash and residue containing nonferrous metals:			
Aluminum [3] ____	7,092	8,172	West Germany 5,865; France 2,276.
Lead ____	4,335	2,805	Belgium-Luxembourg 1,484; West Germany 1,023.
Zinc ____	7,980	12,084	West Germany 5,974; France 2,666; Belgium-Luxembourg 2,061.
Other [3] ____	r 6,866	6,729	West Germany 2,406; United Kingdom 1,216.
Oxides, hydroxides, peroxides of metal, n.e.s ____	72	29	Poland 15; Italy 5; United Kingdom 5.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum __	8,237	6,258	Belgium-Luxembourg 1,241; West Germany 905.
Dust and powder of precious and semiprecious stones including diamond ____ thousand carats __	1,949	1,794	Italy 391; France 250; Switzerland 181; Japan 165.
Grinding and polishing stones ____	1,990	2,348	West Germany 670; United Kingdom 468.
Asbestos ____	220	220	Belgium-Luxembourg 137; West Germany 47.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Barite and witherite	41,295	73,724	United Kingdom 30,683; Norway 22,893; West Germany 9,990.
Borates, crude natural	420,680	343,650	West Germany 65,460; France 58,948; United Kingdom 54,471.
Cement	145,580	253,925	West Germany 134,319; Belgium-Luxembourg 70,414.
Chalk	37,491	30,801	Belgium-Luxembourg 30,563.
Clays and clay products:			
Crude:			
Kaolin	53,905	64,825	Belgium-Luxembourg 62,011.
Refractory	3,056	3,622	United Kingdom 1,772; Belgium-Luxembourg 824.
Other including bentonite	143,547	138,834	West Germany 86,519; Belgium-Luxembourg 32,140.
Products:			
Refractory including nonclay bricks	13,273	24,382	West Germany 6,883; Canada 5,333; Switzerland 3,380.
Nonrefractory thousand tons	732	678	West Germany 478; Belgium-Luxembourg 170.
Diamond, not set or strung, except dust and powder thousand carats	2,520	1,997	United States 620; Belgium-Luxembourg 414; West Germany 244.
Diatomite and other infusorial earth	231	191	Belgium-Luxembourg 63; West Germany 46.
Feldspar, fluorspar, leucite	1,009	623	Belgium-Luxembourg 382; France 160.
Fertilizer materials:			
Crude:			
Nitrogenous (nitrogen content)	r 10	2,806	Sweden 2,532.
Phosphatic	39,681	81,970	West Germany 72,462; Belgium-Luxembourg 9,030.
Other	28,708	34,894	Belgium-Luxembourg 21,329; France 6,944.
Manufactured:			
Nitrogenous thousand tons	2,564	2,454	United States 500; United Kingdom 186; West Germany 139; France 139.
Phosphatic (including Thomas slag) do	348	346	France 104.
Potassic (K_2O content)	287	2,761	Brunei 1,000.
Other including mixed thousand tons	979	977	France 378.
Ammonia, anhydrous do	564	709	Belgium-Luxembourg 297; United Kingdom 103.
Graphite, natural	324	327	West Germany 226.
Gypsum and plasters	1,089	3,479	Belgium-Luxembourg 2,873.
Lime	1,894	2,226	France 722; West Germany 691; Belgium-Luxembourg 607.
Magnesite	32,995	34,785	West Germany 14,872; United Kingdom 4,451.
Mica	540	601	United Kingdom 144; Nigeria 119; West Germany 78.
Pigments, mineral, including processed iron oxides	1,427	2,476	Italy 463; West Germany 448; United Kingdom 330.
Precious and semiprecious stones, except diamond kilograms	8,421	21,190	Italy 10,000; West Germany 3,877.
Salt thousand tons	2,077	2,240	West Germany 650; Sweden 555; Belgium-Luxembourg 507.
Stone, sand and gravel:			
Dimension stone:			
Unworked and partly worked	r 3,806	4,254	West Germany 2,302; Belgium-Luxembourg 961.
Worked	4,318	7,389	West Germany 4,105; Belgium-Luxembourg 2,556.
Dolomite	4,383	12,201	Belgium-Luxembourg 6,153; West Germany 5,895.
Gravel and crushed stone thousand tons	3,831	4,296	Belgium-Luxembourg 3,911.
Limestone	1,188	1,828	Belgium-Luxembourg 1,749.
Quartz and quartzite	10,435	11,391	West Germany 7,757; Belgium-Luxembourg 2,444.
Sand, excluding metal bearing thousand tons	8,964	9,029	Belgium-Luxembourg 8,429.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Sulfur:			
Elemental	832	4,346	Belgium-Luxembourg 2,887; West Germany 1,416.
Sulfur dioxide	1,327	1,050	Belgium-Luxembourg 111.
Sulfuric acid	60,158	179,677	Belgium-Luxembourg 162,612.
Talc and steatite	665	740	Belgium-Luxembourg 270; West Germany 148.
Other nonmetals, n.e.s.:			
Oxides and hydroxides of magnesium, strontium, barium	414	326	West Germany 167; United States 80.
Slag, dross and similar waste not metal bearing:			
From iron and steel manufacture thousand tons	71	51	West Germany 31; Belgium-Luxembourg 20.
Other do	52	73	Belgium-Luxembourg 51; France 10.
Unspecified do	218	197	West Germany 94; France 51; Belgium-Luxembourg 42.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	116	1,037	Belgium-Luxembourg 1,013.
Carbon black	87,282	79,347	France 37,064; West Germany 15,938; Belgium-Luxembourg 9,798.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	1,513	1,022	West Germany 370; Belgium-Luxembourg 360; France 185.
Briquets of anthracite and bituminous coal do	259	23	Belgium-Luxembourg 14; West Germany 5.
Coke and semicoke do	680	726	France 379; Belgium-Luxembourg 245.
Gas:			
Manufactured do	110	145	Belgium-Luxembourg 109; United Kingdom 26.
Natural billion cubic feet	1,294	1,691	West Germany 868; Belgium-Luxembourg 410.
Hydrogen, helium and rare gases	9,662	14,288	West Germany 5,317; Belgium-Luxembourg 4,928.
Petroleum: [4]			
Crude thousand 4-gallon barrels	157,067	4,343	United Kingdom 2,774; Belgium-Luxembourg 1,159.
Refinery products:			
Gasoline do	66,640	61,923	West Germany 39,721; United Kingdom 9,750.
Kerosine and jet fuel do	26,334	20,507	West Germany 7,137; United Kingdom 4,530.
Distillate fuel oil do	123,411	96,473	West Germany 57,076; Belgium-Luxembourg 9,944.
Residual fuel oil do	163,590	133,979	Ship stores 48,858; United Kingdom 20,779; Belgium-Luxembourg 16,184.
Lubricants do	3,302	4,005	United Kingdom 583; Belgium-Luxembourg 526.
Other:			
Liquefied petroleum gas do	6,780	4,483	Belgium-Luxembourg 2,733; Portugal 670.
Mineral jelly and wax do	697	810	West Germany 278; United Kingdom 209; Morocco 100.
Bituminous mixtures do	340	283	West Germany 107; Sweden 81.
Unspecified do	r 2,803	4,209	West Germany 1,166; Denmark 828.
Total do	r 393,897	326,672	
Mineral tar and coal–, petroleum–, or gas–derived crude chemicals thousand tons	427	545	West Germany 162; United Kingdom 161; Belgium-Luxembourg 85.

r Revised. NA Not available.
[1] Excludes monetary gold.
[2] Includes sponge iron, shot, grit, pellets, powder, spiegeleisen and ferromanganese.
[3] Exports of ash and residue containing aluminum to Belgium-Luxembourg are included in "other" ash and residue.
[4] Includes bunkers.

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

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite	128,451	141,285	Greece 136,584.
Alumina	431,899	526,327	Surinam 200,641; France 183,961; Greece 77,744; West Germany 62,668.
Metal including alloys:			
Scrap	20,856	16,744	West Germany 8,627; Belgium-Luxembourg 2,593.
Unwrought	96,831	158,758	Norway 97,177; West Germany 19,650; Canada 17,101.
Semimanufactures	74,071	83,248	West Germany 37,472; Belgium-Luxembourg 26,511.
Antimony metal including alloys, all forms	110	64	Italy 35; Turkey 10; U.S.S.R. 10.
Arsenic oxides and acids	830	839	France 576; Belgium-Luxembourg 194.
Beryllium metal including alloys, all forms	2	3	West Germany 2; United States 1.
Bismuth metal including alloys, all forms	150	119	Belgium-Luxembourg 60; Mexico 46.
Cadmium metal including alloys, all forms	159	94	Japan 33; Belgium-Luxembourg 28.
Chromium:			
Chromite	5,588	27,969	Finland 7,966; Mozambique 6,447.
Oxides and hydroxides	1,655	1,052	West Germany 836; France 125.
Metal including alloys, all forms	55	83	France 30; Japan 20; United Kingdom 17.
Cobalt:			
Oxides and hydroxides	328	338	Belgium-Luxembourg 308.
Metal including alloys, all forms	126	78	United States 33; West Germany 20.
Columbium and tantalum, tantalum	4	2	All from United States.
Copper:			
Copper sulfate	3,213	2,785	France 1,263; Belgium-Luxembourg 1,241.
Metal including alloys:			
Scrap	8,719	10,791	West Germany 4,261; United Kingdom 1,649; France 1,160.
Unwrought	49,863	49,157	Zaire 14,299; U.S.S.R. 8,946; Belgium-Luxembourg 8,944.
Semimanufactures	79,622	77,325	Belgium-Luxembourg 31,378; West Germany 31,235.
Germanium metal including alloys, all forms	5	10	All from Belgium-Luxembourg.
Gold [1] thousand troy ounces	949	1,349	West Germany 1,167.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	6,973	7,061	Sweden 1,856; Brazil 1,613; Liberia 1,595.
Metal:			
Scrap do	182	149	West Germany 72; Belgium-Luxembourg 60.
Pig iron [2] do	67	81	West Germany 38; Norway 7.
Ferroalloys do	49	55	Norway 28; West Germany 10; France 9.
Steel, primary forms do	682	630	Belgium-Luxembourg 405; Norway 140; West Germany 78.
Semimanufactures:			
Bars, rods, sections do	1,475	1,459	Belgium-Luxembourg 744; West Germany 509; France 154.
Universals, plates, sheets do	1,196	1,417	Belgium-Luxembourg 627; West Germany 594; France 87.
Hoop and strip do	233	242	West Germany 168; Belgium-Luxembourg 36.
Rails and accessories do	43	53	France 27; West Germany 20.
Wire do	98	103	West Germany 50; Belgium-Luxembourg 45.
Tubes, pipes, fittings do	763	985	West Germany 673; France 111.
Castings and forgings do	13	16	West Germany 8; Belgium-Luxembourg 5.
Lead:			
Oxides	13,559	13,471	Mexico 4,172; West Germany 4,154; France 3,848.

See footnotes at end of table.

Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Lead—Continued			
Metal including alloys:			
Scrap	35,122	20,489	West Germany 5,849; Sweden 5,658; Canada 4,516.
Unwrought	51,596	46,888	Mexico 12,601; Australia 12,101; United Kingdom 9,734.
Semimanufactures	2,983	2,697	Belgium-Luxembourg 1,731; West Germany 614.
Magnesium metal including alloys:			
Scrap	683	656	West Germany 430; Norway 100.
Unwrought	2,844	2,907	United States 2,198; Norway 362.
Semimanufactures	126	180	Norway 83; West Germany 71.
Manganese:			
Ore and concentrate	79,379	69,681	NA.
Oxide	1,174	1,096	Belgium-Luxembourg 988.
Mercury 76-pound flasks	r 461	884	People's Republic of China 348; Spain 145; United Kingdom 116.
Molybdenum metal including alloys, all forms	158	170	France 62; United States 40; United Kingdom 26.
Nickel:			
Matte, speiss, similar materials	2,757	1,309	All from Cuba.
Metal including alloys:			
Scrap	2,847	3,317	West Germany 1,738; United Kingdom 888.
Unwrought	4,564	4,831	United Kingdom 1,564; Mozambique 806; Norway 599.
Semimanufactures	3,926	4,567	Sweden 2,430; West Germany 873.
Platinum-group metals, all forms thousand troy ounces	79	76	France 27; Italy 19.
Silver metal including alloys, all forms do	6,388	6,489	West Germany 2,216; United Kingdom 1,390; France 1,332.
Tellurium, elemental, arsenic	16	30	United States 14; Sweden 8.
Tin:			
Ore and concentrate	484	2,375	Peru 1,244; United Kingdom 386.
Oxide	r 156	196	Japan 86; United Kingdom 37; West Germany 37.
Metal including alloys:			
Scrap	347	728	West Germany 603.
Unwrought	6,632	6,713	People's Republic of China 1,461; Thailand 1,198; United Kingdom 1,158.
Semimanufactures	107	111	West Germany 99.
Titanium:			
Ore and concentrate (ilmenite)	63,185	50,823	Canada 32,091; Australia 15,243.
Oxide	7,876	7,713	West Germany 4,729; France 1,077.
Metal including alloys, all forms	182	317	United States 141; West Germany 68; U.S.S.R. 42.
Tungsten:			
Ore and concentrate	1,501	3,428	Peru 1,564; People's Republic of China 591; United Kingdom 410.
Metal including alloys, all forms	184	381	West Germany 222; Belgium-Luxembourg 100.
Zinc:			
Ore and concentrate	98,471	205,898	Australia 84,359; West Germany 44,411; Peru 15,655.
Oxides	r 7,085	5,917	France 2,484; Belgium-Luxembourg 1,568; West Germany 1,187.
Metal including alloys:			
Scrap	6,947	8,066	West Germany 7,040.
Dust (blue powder)	3,311	10,957	Belgium-Luxembourg 8,279.
Unwrought	32,097	44,203	Belgium-Luxembourg 23,092; West Germany 12,678.
Semimanufactures	5,579	4,282	West Germany 2,404; Belgium-Luxembourg 1,825.
Other:			
Ores and concentrates of nonferrous metals, n.e.s	93,361	94,173	United States 33,405; Canada 32,308.
Ash and residue containing nonferrous metal:			
Lead	5,642	3,034	West Germany 1,914; United States 462.
Zinc	34,730	20,670	West Germany 14,550.
Other	64,685	103,725	Canada 60,029; Belgium-Luxembourg 27,007.

See footnotes at end of table.

Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Other—Continued			
Metals including alloys, all forms:			
Metalloids:			
Phosphorus	138	141	West Germany 127; Sweden 14.
Selenium	13	11	West Germany 4; United States 3.
Silicon	955	1,340	France 518; Norway 344; West Germany 271.
Alkali, alkaline earth, rare-earth metals	200	177	West Germany 163.
Base metals including alloys, all forms, n.e.s	623	1,125	Republic of South Africa 377; United States 186; France 183.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc ... thousand tons	268	184	West Germany 176.
Dust and powder of precious and semiprecious stones ... thousand carats	r 2,054	2,195	Ireland 1,494; United Kingdom 606.
Grinding and polishing stones	2,075	2,556	West Germany 1,264.
Asbestos	37,718	48,237	Canada 39,351.
Barite and witherite	101,296	126,773	Peru 71,714; Ireland 15,846.
Boron materials:			
Crude natural borates	380,822	395,847	United States 371,910.
Oxide and acid	2,324	2,862	France 1,022; Turkey 785; United States 747.
Cement ... thousand tons	2,464	2,211	West Germany 1,207; Belgium-Luxembourg 960.
Chalk	137,162	128,816	France 53,871; Belgium-Luxembourg 50,427; West Germany 14,662.
Clays and clay products:			
Crude clays:			
Bentonite [3] ... thousand tons	37	32	United States 16; West Germany 9; Greece 6.
Kaolin ... do	324	413	United Kingdom 193; West Germany 152.
Refractory ... do	23	34	West Germany 10; France 6; United States 3.
Other [3] ... do	514	485	West Germany 433.
Products:			
Refractory, including nonclay bricks ... do	60	76	West Germany 39; United Kingdom 20.
Nonrefractory ... do	223	239	West Germany 120; Belgium-Luxembourg 67.
Cryolite and chiolite	268	499	Denmark 474.
Diamond, all types ... thousand carats	2,418	2,454	Belgium-Luxembourg 1,073; United Kingdom 1,006.
Diatomite and other infusorial earth	9,318	13,736	Denmark 4,460; France 3,074; Spain 2,377.
Feldspar, fluorspar, leucite	56,780	68,764	Belgium-Luxembourg 9,787; West Germany 3,618.
Fertilizer materials:			
Crude:			
Nitrogenous	26,138	26,663	All from Chile.
Phosphatic ... thousand tons	2,093	2,365	United States 751; Morocco 620; Senegal 268.
Potassic salts ... do	10	9	West Germany 7.
Other ... do	52	55	West Germany 49.
Manufactured:			
Nitrogenous ... do	83	83	Belgium-Luxembourg 29; France 22; United Kingdom 17.
Phosphatic:			
Thomas slag (P_2O_5 content) ... do	17	17	Belgium-Luxembourg 16.
Other (P_2O_5 content) ... do	29	12	Poland 6; Tunisia 5.
Potassic ... do	403	442	West Germany 170; France 74; East Germany 63.
Other including mixed ... do	97	124	Belgium-Luxembourg 49; West Germany 41.
Ammonia	15,113	3,416	France 3,018; Belgium-Luxembourg 364.
Graphite, natural	402	437	People's Republic of China 200; West Germany 139.
Gypsum and plasters ... thousand tons	303	356	West Germany 191; France 148.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Lime ---------- thousand tons --	1,063	1,056	Belgium-Luxembourg 598; West Germany 457.
Magnesite ----------	64,501	61,504	Greece 39,790.
Mica:			
Crude including splittings and waste	1,994	1,737	Norway 512; People's Republic of China 500; United States 271.
Worked including agglomerated splittings ----------	68	55	Switzerland 22.
Pigments, mineral:			
Natural, crude ----------	1,100	2,033	West Germany 870; Austria 724; Cyprus 203.
Iron oxides, processed ----------	12,420	13,473	West Germany 11,946.
Precious and semiprecious stones, except diamond ---------- kilograms --	180,126	270,460	Brazil 213,651.
Pyrite (gross weight) ----------	180	207	U.S.S.R. 131; Italy 45; West Germany 31.
Salt ----------	17,137	24,448	West Germany 14,358; France 9,637.
Sodium and potassium compounds, n.e.s.:			
Caustic soda ----------	150,824	164,757	West Germany 102,281; Belgium-Luxembourg 51,704.
Caustic potash ----------	r 6,001	7,159	France 3,284; Belgium-Luxembourg 1,837.
Stone, sand and gravel:			
Dimension stone:			
Unworked and partly worked thousand tons --	1,773	1,375	Belgium-Luxembourg 482; Sweden 231; West Germany 180.
Worked ----------	40,631	42,608	Italy 21,784; Portugal 5,432.
Dolomite ---------- thousand tons --	799	823	Belgium-Luxembourg 729.
Gravel and crushed rock --- do ----	13,884	14,407	West Germany 8,223; Belgium-Luxembourg 4,271.
Limestone ---------- do ----	857	752	Belgium-Luxembourg 739.
Quartz and quartzite ----------	32,578	28,719	Norway 12,988; Belgium-Luxembourg 12,929.
Sand excluding metal bearing thousand tons --	7,353	7,368	West Germany 6,711.
Sulfur:			
Elemental ---------- do ----	454	498	United States 384; Poland 101.
Sulfur dioxide ----------	147	50	West Germany 49.
Sulfuric acid ----------	196,007	297,933	West Germany 157,199; Poland 70,024.
Talc and steatite ----------	14,600	15,651	Norway 5,537; Austria 5,190; France 1,891.
Other nonmetals, n.e.s.:			
Crude:			
Quartz, electronic grade kilograms --	(4)	123	West Germany 53.
Other ---------- thousand tons --	2,262	1,338	West Germany 768; Belgium-Luxembourg 560.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture ---------- do ----	3,117	3,440	West Germany 2,412; Belgium-Luxembourg 943.
Slag and ash, n.e.s ---- do ----	765	707	West Germany 504; Belgium-Luxembourg 203.
Oxides of barium, strontium, magnesium ----------	1,080	1,076	West Germany 469; United States 161; United Kingdom 112.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural ----------	r 1,590	1,928	United States 1,546.
Carbon black (including gas carbon) --	11,437	11,537	West Germany 8,809.
Coal and briquets:			
Anthracite and bituminous coal thousand tons --	3,862	4,262	United States 1,347; West Germany 1,112; Poland 907; Australia 626.
Briquets of anthracite and bituminous coal ---------- do ----	2	7	West Germany 6.
Lignite and lignite briquets ---------- do ----	20	18	All from West Germany.
Coke and semicoke ---------- do ----	666	797	West Germany 676.
Gas, natural ---- thousand cubic feet --	109,864	NA	
Peat including peat briquets thousand tons --	155	179	West Germany 175.

See footnotes at end of table.

Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum: [5]			
Crude thousand 42-gallon barrels	734,587	447,356	Iran 281,637; Nigeria 102,599.
Refinery products:			
Gasoline do	43,358	37,664	U.S.S.R. 9,852; Italy 5,223; West Germany 4,903.
Kerosine and jet fuel do	3,396	1,772	Italy 730; United Kingdom 305.
Distillate fuel oil do	15,606	14,786	United Kingdom 4,398; U.S.S.R. 3,292; Italy 1,405.
Residual fuel oil do	10,896	5,692	Belgium-Luxembourg 1,869; United Kingdom 1,552; West Germany 862.
Lubricants do	2,032	1,893	Belgium-Luxembourg 561; United Kingdom 428; France 285.
Other:			
Liquefied petroleum gas do	NA	455	West Germany 276; Libya 68.
Mineral jelly and wax do	273	359	West Germany 102; France 89; United Kingdom 66.
Bituminous mixtures do	NA	274	Belgium-Luxembourg 245.
Unspecified do	4,047	4,851	West Germany 1,819; Belgium-Luxembourg 1,094.
Total do	79,608	67,746	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons	242	362	West Germany 127; United Kingdom 95; Belgium-Luxembourg 64.

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 in other clays.
[4] Less than ½ unit.
[5] Includes bunkers.

COMMODITY REVIEW

METALS

Aluminum.—Plans were announced to expand the Vlissingen smelter to a capacity of 280,000 tons per year, at an estimated cost of $114 million. Construction was scheduled to start in 1977.

Two producers accounted for all of the Netherlands production of primary aluminum, from imported alumina. Aluminium Delfzijl N.V., at Delfzijl, northeast Netherlands, a member of the Billiton (Royal Dutch/Shell) group, had a capacity of 106,000 tons of aluminum ingots per year. The other producer, Péchiney–Nederland N.V. at Vlissingen (Flushing) in the southwest, with a capacity of 187,000 tons per year, was owned by the Péchiney Ugine Kuhlmann group (85%), with the remainder held by Hunter Douglas N.V. and Alcan Aluminium Ltd.

Iron and Steel.—Start of construction on the ore pelletizing plant in the Europoort outer harbor at Rotterdam had not occurred by the end of 1975, because of delays in obtaining numerous environmental and local clearances. The plant, to be constructed by three West German steel producers—August Thyssen–Hüettenwerke AG, Mannesmann AG, and Friedr. Krupp GmbH, would supply the German blast furnaces of these companies. It would produce 4 million tons of pellets per year from imported ores and employ 190 persons. The latest cost estimate was over $158 million.

The only producer of pig iron and the largest producer of steel in the Netherlands was Hoogovens IJmuiden B.V., a subsidiary of ESTEL N.V., which in turn is controlled by the two steel companies, Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V. (KNHS) of the Netherlands and Hoesch AG of West Germany. Steel is also produced at Alblasserdam, near Rotterdam, by NKF Staal B.V., which is controlled by the NKF Groep B.V. and in which Thyssen has a minority interest; and at Utrecht, by N.V. Staalgietwerk SMDK, a subsidiary of Hoogovens IJmuiden B.V.

Magnesium.—Billiton Delfstoffen B.V. applied for a concession for the solution mining of potassium and magnesium salts in the provinces of Groningen and Drente, near Veendam. Agreement was reached with Norsk Hydro A.S. for a joint venture; 70 million to 80 million guilders would be invested by Billiton in a magnesium oxide plant and 1 million guilders by Norsk Hydro in a refinery for purification of magnesium and potassium chloride. Yearly processing capacity of salt solution (15% to 20% magnesium chloride) would be approximately 1 million tons by the Billiton plant and 700,000 tons by the Norsk Hydro refinery. Estimated output of the Billiton plant would be 100,000 of magnesium oxide per year; Norsk Hydro would process its product to magnesium metal in Norway. A final decision on the entire project, dependent on final test drillings, was to be made in 1976, allowing a possible startup in 1978.

Zinc.—The Netherlands' only primary zinc producer was Kempensche Zink Maatschappij B.V. at Budel on the Belgian border, which was jointly owned by Billiton Maatschappij B.V., a subsidiary of Royal Dutch/Shell, and Australian Mining and Smelting Europe, a subsidiary of two Australian zinc producers. Output of the recently expanded electrolytic zinc plant (capacity 150,000 tons per year) was increasing rapidly. Billiton acquired an 11.25% interest in Nanisivik Mines on Baffin Island, Canada, and the mine was to supply 50,000 tons of concentrate per year to Budel starting in 1976.

NONMETALS

Potash.—Potash would be solution-mined near Veendam, along with magnesium, if a project under study by Billiton Delfstoffen is carried out (see section on magnesium).

MINERAL FUELS

Energy.—Total consumption of energy in the Netherlands increased almost three times between 1960 and 1974, according to figures published by the Centraal Bureau voor de Statistiek. In the period the contribution made by coal declined from over 50% to under 5% of the total, while that of natural gas increased from 1% to 54%. Figures for 6 months of 1975 showed a continuation of these trends: Coal provided 4% of all energy and natural gas 61%; the remaining energy was provided in each year almost entirely by petroleum. The energy balance for the years 1973 and

1974, given in table 4, is the gross balance, including conversion losses and excluding stock changes. In 1974 the Netherlands was for the first time a net energy exporter because of the continued growth in natural gas production and exports.

Table 4.—Netherlands: Supply and apparent consumption of energy-producing materials for 1973 and 1974
(In million tons of standard coal equivalent) [1]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Nuclear power
1973:					
Production	98.4	1.7	2.3	94.3	0.1
Imports	117.7	4.5	113.2	--	--
Exports	117.7	2.4	70.9	44.3	.1
Apparent consumption	[2] 98.4	3.8	[2] 44.6	50.0	--
1974:					
Production	114.9	.8	2.2	111.5	.4
Imports	107.4	5.0	102.4	--	--
Exports	123.4	1.7	63.5	58.0	.2
Apparent consumption	[2] 98.9	4.1	[2] 41.1	53.5	.2

[1] 1 ton standard coal equivalent (SCE) = 7,000,000 kilocalories.
[2] Includes refinery fuel and losses.

Source: Adapted from United Nations, World Energy Supplies 1950–1974, Statistical Papers, ser. J, No. 19, 1976, 825 pp.

Coal and Coke.—The last two Dutch coal mines closed down late in 1974. No plans were advanced during 1975 to reopen any mine. Most of the 40,000 mineworkers whose jobs had been eliminated in the 10 years prior to the closing retired, were retrained, or found jobs elsewhere, but unemployment in the former mining area of Limburg remained high.

Natural Gas.—Two major additional gasfields were discovered in the Dutch sector of the Continental Shelf by the Shell-Esso exploration partnership—Nederlandse Aardolie Maatschappij. The first field, announced in October, was located off Ameland Island on the north coast; reserves were estimated at 50 billion cubic meters of gas. The second field, announced less than a month later, was located about 36 miles northwest of the Dutch naval base of Den Helder, north of Amsterdam; it was reported to contain possibly as much as 40 billion cubic meters.

Natural gas resources in the Netherlands, both onshore and offshore on the Continental Shelf, were estimated by official sources as follows, as of October 1, 1975, in billions of cubic meters:

	Proven	Probable
Slochteren (Groningen) Field	1,620	190
Other onshore fields	120	180
Continental Shelf	60	170
Total	1,800	540

The above figures do not include the 90 billion cubic meters announced subsequently in the Ameland Island and Den Helder offshore areas. The Slochteren reserves reportedly constituted the world's largest producing natural gasfield and provided one-half of West European requirements.

Nitrogen.—An application for planning permission was submitted by DSM for increasing the ammonia capacity of its subsidiary, Unie van Kunstmestfabrieken (UKF), at Geleen, Limburg, by 440,000 tons of ammonia per year. Construction was expected to start early in 1976.

Total ammonia production capacity in the Netherlands was estimated in 1975 as follows:

Company and location	Capacity (thousand tons per year)	Startup date
Esso Chemie:		
Rotterdam-Europoort	371	1969
Possible additional	(11)	1974
Nederlandse Stickstoff:		
Sluiskil	298	1965–66
Unie van Kunstmestfabrieken (UKF):		
Geleen	272	1971
Do	108	1965
Do	108	1966
Do	108	1967
Do	365	NA
Pernis (Rotterdam)	250	1966
Ijmuiden	250	NA
Total	2,130	
Possible additional	(11)	

NA Not available.

Petroleum.—The Netherlands refineries operated at only 50% to 60% of capacity in 1975, and unit costs increased substantially. After completion of the Total refinery in Vlissingen in 1974, total crude oil refining capacity was reported as follows:

Refinery	Location	Capacity (million tons per year)
B.P. Raffinaderij Nederland N.V	Rotterdam	24.5
B.V. Smid & Hollander	Amsterdam	.3
Compagnie Française des Petroles (Total)	Vlissingen-Oost	7.2
Chevron Petroleum Maatschappij Nederland N.V	Rotterdam (Pernis)	15.0
Esso Nederland B.V	Rotterdam	16.2
Gulf Oil Raffinaderij B.V	Rotterdam (Rozenburg)	4.7
Mobil Oil N.V	Amsterdam	6.2
Shell Nederland Raffinaderij B.V	Rotterdam (Pernis)	25.0
Total		99.1

Source: Adapted from Petroleum Times, Jan. 23, 1976, p. 43.

The Mineral Industry of New Zealand

By Walter C. Woodmansee[1]

New Zealand's mineral industry showed little change during 1975, a period of mild economic recession when demand for its mineral products was slack in the export market. Output of most of the limited number of mineral commodities produced was at about the same level or was lower than that of 1974. However, production of two valuable commodities—natural gas and ironsand concentrate—was higher in 1975.

Exploration, which was relatively costly owing to New Zealand's remoteness and difficult land transportation, was increasing onshore and offshore from both islands, with some favorable indications. Principal exploration activity was for base metals, gold, coal, oil, and gas. For oil and gas, a semisubmersible drill rig and a drilling vessel arrived in New Zealand waters and drilled several offshore wells during the year.

PRODUCTION

Total value of mine and quarry output (metals and nonmetals), exclusive of the mineral fuels, was $70.2 million,[2] compared with $74.3 million in 1974. This loss in output value was in part attributed to a 15% devaluation of the New Zealand dollar in August 1975. Value was $13.7 million in the metals sector and $56.5 million in the nonmetals sector. Principal commodities in these sectors in 1974 and 1975 were as follows, in thousand dollars (1974 values converted at the 1975 rate for comparability):

	1974	1975
Sand and gravel	$43,598	$41,983
Ironsand concentrate	11,671	13,264
Stone (principally limestone)	11,178	11,979
Clays	859	1,126
Silica (glass sand)	588	647
Gold	531	389

Data were not available on output values for other metal products, cement, and the mineral fuels, but estimated values are as follows: Steel billets, $23 million; nonferrous metals and alloy castings (principally copper and aluminum), $6 million; cement, $30 million; coal, $25 million; coke, $0.5 million; natural gas, $4.0 million; and natural gas liquids, $17 million. On this basis, total mineral output value was estimated at nearly $176 million, or 1.7% of the gross national product estimated at $10,051 million for 1975 (current prices).

Coal production was down slightly, but the industry was undergoing mechanization and expansion to provide increased fuel supplies for domestic power and the export market. Output of natural gas and liquids was higher as new wells were brought into production in the Kapuni gasfield, and development continued at the large, offshore Kaui gasfield. Plans proceeded for expansion at New Zealand's only petroleum refinery, where output was down because of rising prices and energy conservation practices.

[1] Supervisory physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from New Zealand dollars (NZ$) to U.S. dollars at the rate of NZ$1.00=$1.054.

Table 1.—New Zealand: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Aluminum, smelter production	r 116,100	110,300	109,500
Cadmium, mine output, metal content [1]	4	--	--
Copper, mine output, metal content [2]	r 43	--	--
Gold, mine output, metal content [3] troy ounces	11,044	4,710	2,747
Iron and steel:			
Iron ore, gross weight	466	219	329
Ironsand, gross weight [4]	2,181,164	2,352,653	2,297,056
Sponge iron e thousand tons	100	130	150
Crude steel do	r 190	194	198
Lead, mine output, metal content [2]	r 319	--	--
Silver, mine output, metal content [2] troy ounces	49,181	1,814	e 2,000
Tungsten, mine output, metal content	1	4	e 5
Zinc, mine output, metal content [2]	r 605	--	--
NONMETALS			
Cement, hydraulic thousand tons	1,058	1,068	1,085
Clay:			
Bentonite	1,031	5,069	5,246
Fireclay	210,021	257,389	211,423
Kaolin (including china clay)	9,218	16,711	26,997
Diatomite	4,501	4,558	3,055
Kauri gum	10	--	--
Magnesite	1,155	826	791
Perlite	1,599	465	1,500
Pumice	56,909	70,328	37,857
Salt	r 103,124	54,864	40,000
Sand and gravel:			
Glass sand	124,405	148,633	147,738
Common sand and gravel [5] thousand tons	29,291	27,624	22,628
Stone:			
Dolomite	15,713	20,935	13,598
Greenstone	4	6	--
Limestone and marl:			
For agriculture thousand tons	r 1,696	1,540	1,502
For roads do	--	134	NA
For industry, except cement do	238	114	125
For cement do	1,783	1,884	1,838
Serpentine do	74	89	60
Unspecified:			
Dimension	36,547	35,085	23,091
Rock for harbor work thousand tons	803	2,132	3,296
Sulfur	--	224	585
MINERAL FUELS AND RELATED MATERIALS			
Carbon dioxide, natural (produced with natural gas) million cubic feet	5,485	6,667	e 7,300
Coal:			
Bituminous thousand tons	422	422	457
Subbituminous do	1,902	1,998	1,819
Lignite do	145	144	136
Total do	2,469	2,564	2,412
Coke, gashouse do	27	31	30
Fuel briquets do	15	3	--
Gas, natural: [6]			
Gross production million cubic feet	9,339	10,429	e 11,500
Marketed production do	r 9,323	10,594	11,442
Natural gas liquids thousand 42-gallon barrels	9	25	e 27
Petroleum:			
Crude (field condensate) do	1,290	1,385	1,423
Refinery products:			
Gasoline do	9,527	10,783	10,402
Distillate fuel oil do	4,563	4,578	4,219
Residual fuel oil do	8,787	9,607	6,722
Other do	641	763	505
Refinery fuel and losses do	r 1,807	2,167	1,568
Total do	r 25,325	27,898	23,416

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

Among the metals, expansion continued at New Zealand's one aluminum reduction plant, which was scheduled for completion in 1976, and in ironsand concentrate production, which provided raw materials for the domestic iron and steel industry and was an important export commodity. Previously announced expansion plans for iron and steel capacity were deferred because of lagging domestic and foreign demand for steel.

TRADE

New Zealand's principal trading partners for mineral commodities were Australia and Japan. The principal mineral export was ironsand concentrate, which went wholly to Japan. The Mineral Resource Council took steps to expand export sales for ironsand and for coal, clays, and ilmenite. Principal mineral imports were crude petroleum and petroleum refinery products which, according to the Department of Statistics at Wellington, were valued at $334 million ($179 million in 1974). Total import value for all commodities was $2,610 million ($1,977 million in 1974).

Table 2.—New Zealand: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	525	531	Guyana 493.
Oxide and hydroxide	253,047	213,021	Australia 185,214.
Metal including alloys:			
Unwrought	2,823	1,329	Australia 1,076.
Semimanufactures	r 4,441	9,225	Australia 4,167; United Kingdom 1,594; Belgium-Luxembourg 1,035.
Arsenic trioxide, pentoxide, acids	1,063	1,537	United States 1,292.
Chromium oxide and hydroxide	246	290	West Germany 109; U.S.S.R. 51.
Cobalt oxide and hydroxide	16	7	NA.
Copper metal including alloys:			
Unwrought	1,279	2,276	Australia 1,821; United Kingdom 452.
Semimanufactures [1]	13,065	12,108	Australia 8,561; Canada 1,633; United Kingdom 1,466.
Iron and steel metal:			
Scrap	r 39,219	15,440	United States 12,248.
Pig iron, ferroalloys, similar materials	8,396	10,869	Australia 5,028; Republic of South Africa 4,750.
Steel, primary forms	r 23,843	28,766	Australia 23,099; Belgium-Luxembourg 5,495.
Semimanufactures:			
Bars, rods, angles, shapes, sections	110,657	192,048	Japan 91,237; Australia 79,174.
Universals, plates, sheets	349,510	481,665	Japan 365,761; Australia 67,541.
Hoop and strip	18,492	26,280	Japan 13,192; Australia 7,474; United Kingdom 3,561.
Rails and accessories	13,399	6,088	United Kingdom 5,360.
Wire	28,245	36,877	Australia 15,471; Japan 9,321; United Kingdom 7,309.
Tubes, pipes, fittings	34,339	45,169	Australia 26,578; Japan 7,115; United Kingdom 4,863.
Castings and forgings, rough	r 484	272	Australia 126; United Kingdom 84.
Lead:			
Oxides	361	431	Australia 404.
Metal including alloys, all forms	r 6,879	8,104	Australia 7,999.
Magnesium metal including alloys, unwrought	147	272	United States 141; U.S.S.R. 129.
Manganese:			
Ore and concentrates	--	531	United States 505.
Oxides	491	1,010	Australia 433; United States 267; Japan 235.
Nickel metal including alloys:			
Unwrought	207	118	Canada 117.
Semimanufactures	232	210	United Kingdom 77; Australia 72; United States 40.
Platinum-group metals and silver:			
Waste and sweepings__value, thousands	$97	$258	All from Australia.

See footnotes at end of table.

Table 2.—New Zealand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Platinum-group metals and silver—Continued			
Metals including alloys:			
Platinum group ---value, thousands--	$152	$280	United Kingdom $120; Australia $96.
Silver ----do----	$1,435	$2,263	Australia $2,091.
Tin:			
Oxides ----	15	23	Australia 14.
Metal including alloys:			
Unwrought ----	r 252	339	Australia 333.
Semimanufactures ----	121	50	NA.
Titanium oxides ----	1,823	1,942	Japan 945; United States 350; Australia 255.
Tungsten metal including alloys, all forms value, thousands--	$211	$382	United Kingdom $218; United States $90; Netherlands $56.
Zinc:			
Oxide ----	99	81	NA.
Metal including alloys:			
Unwrought ----	20,304	21,005	Australia 21,001.
Semimanufactures ----	766	628	Australia 460; United Kingdom 147.
Other:			
Ore and concentrate of molybdenum, tantalum, titanium, vanadium, zirconium ----	r 365	862	Australia 825.
Oxides, hydroxides and peroxides of metals, n.e.s ----	r 166	257	United States 61; Norway 46; West Germany 35.
Metals including alloys, all forms:			
Metalloids ----value, thousands--	$261	$614	France $242; Yugoslavia $142; West Germany $95.
Base metal including alloys, all forms, n.e.s ----do----	$357	$622	People's Republic of China $267; Australia $132; United States $105.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc ---	177	139	NA.
Grinding and polishing wheels and stones value, thousands--	$988	$1,374	United Kingdom $528; Australia $336; Japan $179.
Asbestos ----	8,812	8,184	Canada 5,806; Australia 1,440.
Barite and witherite ----	963	3,496	Australia 1,809; United States 1,143.
Boron materials:			
Crude natural borates--value, thousands--	$170	$178	United States $115; Turkey $51.
Oxide and acid ----	211	745	United States 559.
Cement ----	5,105	8,454	United Kingdom 4,999; Japan 1,910; West Germany 938.
Chalk ----	633	1,375	France 737; United Kingdom 611.
Clays and clay products (including all refractory bricks):			
Crude clays, n.e.s ----	7,618	9,803	United States 6,023; United Kingdom 1,692; Australia 1,080.
Products:			
Refractory (including nonclay bricks) value, thousands--	$2,506	$4,165	Australia $1,730; United Kingdom $1,601.
Nonrefractory ----do----	$448	$938	Japan $570; United Kingdom $224.
Diamond:			
Gem, not set or strung ----do----	$2,128	$2,445	Republic of South Africa $1,257; United Kingdom $569.
Industrial ----do----	r $54	$86	Australia $57.
Diatomite and other infusorial earth ----	732	946	United States 763.
Feldspar, fluorspar, nepheline syenite ----	r 1,489	2,053	Norway 1,619.
Fertilizer materials:			
Crude ----thousand tons--	1,176	1,029	Australia 403; Nauru 382; Gilbert Island 242.
Manufactured:			
Nitrogenous ----value, thousands--	$9,615	$16,197	Japan $13,717.
Phosphatic ----	14,201	5,322	Belgium-Luxembourg 3,219; United States 1,993.
Potassic ----	312,577	235,823	United States 199,275; U.S.S.R. 19,851; Canada 13,333.
Other, including mixed value, thousands--	$5,643	$7,000	United States $5,389; West Germany $841.
Ammonia ----	488	450	Australia 347; United States 98.

See footnotes at end of table.

Table 2.—New Zealand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Graphite, natural	--	193	NA.
Gypsum and plasters	186,474	171,611	Australia 170,452.
Magnesite	1,280	1,815	People's Republic of China 1,490.
Mica:			
Crude, including splittings and waste value, thousands	$53	$81	NA.
Worked, including agglomerated splittings do	$113	$214	United Kingdom $99; Australia $54.
Pigments, mineral:			
Natural, crude	302	304	Austria 141.
Iron oxides, processed	1,041	1,164	West Germany 637; Japan 236.
Precious and semiprecious stones, except diamond:			
Natural value, thousands	$1,240	$1,882	Australia $916; Thailand $245; West Germany $239.
Manufactured do	--	$105	NA.
Salt	45,227	45,940	Australia 24,159; United Kingdom 20,052.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	15,699	9,509	United Kingdom 5,131; Australia 1,336; Netherlands 1,091.
Caustic potash, sodic and potassic peroxides	543	853	France 316; West Germany 169; Japan 103.
Stone, dimension:			
Crude and partly worked	834	916	Republic of South Africa 388; Italy 164; Belgium-Luxembourg 136.
Worked value, thousands	$101	$209	Italy $121.
Sulfur, elemental, other than colloidal	224,716	294,258	Canada 230,204; United States 52,978.
Talc, steatite, soapstone, pyrophyllite	2,168	2,318	Australia 1,885.
Other nonmetals, n.e.s.:			
Crude value, thousands	$158	$118	NA.
Oxides and hydroxides of magnesium, strontium and barium	930	1,001	Australia 689; United States 289.
Bromine, iodine, fluorine	12	10	NA.
Building materials of asphalt, asbestos, fiber cement, unfired nonmetals, n.e.s. value, thousands	$53	$2,233	Australia $2,084.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	7,839	9,915	Australia 8,710.
Coal	571	1,806	Japan 871; France 672; United States 250.
Coke and semicoke	1,937	3,673	All from Australia.
Gas, hydrocarbon value, thousands	$201	$263	France $161; Australia $78.
Hydrogen and rare gases	110	312	Australia 309.
Peat, including peat briquets and litter	--	255	NA.
Petroleum:			
Crude and partly refined:			
Crude thousand 42-gallon barrels	16,998	18,263	Kuwait 13,898; Iran 3,345.
Partly refined do	6,185	6,336	Singapore 2,479; Kuwait 1,643; Iran 906.
Refinery products:			
Gasoline do	r 3,157	4,549	Australia 1,796; Iran 1,002; Singapore 746.
Kerosine and jet fuel do	r 1,991	2,496	Australia 1,688; Iran 350.
Distillate fuel oil do	2,450	2,969	Australia 1,818; Bahrain 551.
Residual fuel oil do	--	227	Australia 122; Iran 52; United Kingdom 28.
Mineral jelly and wax do	34	51	Japan 17; Indonesia 10; West Germany 7.
Lubricants value, thousands	$7,305	$14,860	Australia $6,150; United Kingdom $2,641; Singapore $2,103.
Other:			
Nonlubricating oils, n.e.s. thousand 42-gallon barrels	59	65	United States 34; Australia 19.
Pitch do	--	76	Australia 75.
Bituminous mixtures, n.e.s. do	5	12	Australia 7; United Kingdom 5.
Petroleum coke value, thousands	$2,654	$2,544	All from United States.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals do	r $987	$1,929	Japan $1,219; Netherlands $291.

r Revised. NA Not available.

[1] Partial figures. Excludes copper foil, powders and flakes valued at: 1973–$1,169,000; 1974–$2,009,000.

COMMODITY REVIEW

METALS

Aluminum.—New Zealand Aluminium Smelters Ltd., comprising government interests, Comalco Industries (Pty.) Ltd. (Australia), Showa Denko KK (Japan), and Sumitomo Chemical Co. Ltd. (Japan), continued an expansion program at its reduction plant on Tiwai Point, near Bluff. Annual capacity of 110,000 tons, based on alumina imported from Australia, was to be increased to 150,000 tons.

A proposal by Otago Metal Industries Ltd. to establish New Zealand's second aluminum smelter, at Aramoana in Otago Harbor, was rejected by the Government. The metal would be produced for the export market, and government authorities rejected export of an energy-intensive resource for insufficient financial returns.

Copper-Lead-Zinc.—Base metal exploration was underway in several districts, but no significant discoveries were reported. Otter Minerals Exploration Ltd. conducted a regional stream sampling program in the Baton River catchment area, Nelson District, South Island, and Minerals Exploration Ltd. was drilling in the same area. Prospecting activity was also underway on Coromandel Peninsula, near Auckland. Pennzoil of Australia Ltd. was also sampling stream sediments in the headwaters area of the Anatoki and Slate Rivers, Nelson District.

The Department of Scientific and Industrial Research (DSIR) developed a process for removal of most of the mercury content in base metal ores from the Tui mine at Te Aroha, where operations ended in 1973 when a supply contract for delivery of concentrate to Japan was terminated. The mercury content of the concentrate had been unacceptable under Japanese regulations.

Gold.—Activity was limited, and production from dredging operations decreased compared with that of 1974. Kanieri Gold Dredging Ltd., which had the only operating dredge, produced 1,859 troy ounces of gold at the lower end of, and downstream from, its license area on the Taramakau River, west coast, South Island. Operational time was lost when the dredge was reconditioned. The dredge was also working back through tailings, which also contributed to production losses. Kanieri sought government funds for moving from the Taramakau River to the Grey River, 48 kilometers to the north, but the move was deferred.

Mineral Resources (New Zealand) Ltd. recovered a small quantity of gold by retreating tailings material from old mine sites.

About 10 of 61 current claims were operated intermittently, when weather permitted, in the Southern District, South Island. Carpentaria Exploration Co. Pty. Ltd. and Lime and Marble Ltd. were drilling alluvium along the west coast, South Island. Investigations were also underway on alluvial materials in the Otago goldfields in the southern part of the South Island.

Ironsands.—For the year ended March 31, 1976, New Zealand Steel Mining Ltd. produced 1,274,442 tons of titanium-iron (ilmenite-magnetite) concentrate containing 56% to 60% iron for domestic steelmaking and for shipment to Japan. This concentrate was produced by magnetic separation from raised beach and dune black ironsands at Taharoa and the Waikato North Head area, along the west coast of the North Island. The Taharoa concentrate was exported and the Waikato concentrate was shipped to the company's iron reduction plant at Glenbrook.

Waipipi Ironsands Ltd. shipped 1,019,049 tons of concentrate from Waipipi Point, near Waverly, also on the North Island, to Japan. For this operation, Marcona Corp. (United States) had joined with Europa Oil (New Zealand) Ltd. to adapt the Marconaflo system for transporting a concentrate slurry through an underwater pipeline to an offshore loading buoy. Waipipi made plans to expand concentrate capacity from 1.2 million to 2 million tons per year with a second dredging unit. The pipeline also was to be extended to deeper water to accommodate vessels of 150,000 deadweight tons (currently 65,000 deadweight tons), and a new mooring/loading buoy was to be installed.[3]

Ironsand resources on both the North Island and the South Island had been esti-

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[3] Iron and Steel International. Development of New Zealand's Iron Sands. V. 49, No. 1, February 1976, pp. 45–49.

mated to be as much as 5 billion tons, and titanomagnetite resources had been estimated at 800 million tons, largely on the North Island. The DSIR estimated resources of ilmenite concentrate of 50 million tons from black sands south of Westport on the west coast of the South Island.

Iron and Steel.—New Zealand Steel Mining reported production at its Glenbrook Steelworks, 58 kilometers south of Auckland, for the year ended Mar. 31, 1976, as follows, in tons:

Sponge iron	113,135
Billets	106,127
Galvanized flat products	92,727
Pipe and hollow sections	18,189

Designed direct reduction and billet capacity was 150,000 tons per year, and pipe and tube capacity was 40,000 tons per year. A planned $400 million expansion was deferred owing to poor economic conditions and depressed demand for steel. This plan would have provided an integrated operation by 1980, including a threefold increase in iron reduction and steelmaking capacity with one new kiln, an 800,000-ton-per-year hot-rolling mill, and an expanded galvanizing line. The Government was to take a 35% stock interest and guarantee overseas loans. The proposed expansion would have provided 75% national self-sufficiency in steel and would have saved an estimated $150 million in foreign exchange from reduced imports of foreign steel.

Titanium.—McLaughlin and Associates Ltd. sent black sand concentrates from Taurango on the east coast of the North Island to Australia for metallurgical testing.

Tungsten.—Small-scale scheelite mining continued at Glenorchy and Macrae's Flats in the southern part of the South Island, although no shipments were reported for the year. Production costs were high because of small, broken veins and difficult access and transportation.

NONMETALS

Asbestos.—Markets were sought for the very short fiber variety, which comprised a high proportion of deposits in the Upper Takaka area, Nelson District, at the northern end of the South Island.

Cassiar Asbestos Corp. Ltd. of Canada had withdrawn from the Pyke River-Little Red Hill area, Otago District, in the southern part of the South Island, but a new joint venture to continue investigations appeared probable.

Cement.—Production by Golden Bay Cement Co. Ltd. at Tarakohe, South Island, was down slightly, but New Zealand Cement Holdings Ltd. increased output by 6% at Cape Foulwind, also on the South Island, where a new kiln went into operation in July.

Clays.—A new grade of bentonite for use in oil well drilling was produced at Coalgate, South Island. Bentonite was also exported to Tasmania and Japan for use in iron ore pelletization.

Peat Wax.—The DSIR conducted research on solvent systems and extraction technology for montax wax from moorland peat beds on the Chatham Islands and from lignites in the central Otago area, South Island.

Phosphate.—Sea floor deposits of phosphorite nodules, 300 to 500 meters deep, were prospected in the Chatham Rise area, offshore west of the Chatham Islands.

Sand and Gravel.—Quarrying of sand and gravel for concrete aggregate, other industrial uses, roads, and ballast was New Zealand's principal mineral activity. Demand for aggregate was high, particularly for roads. Locally, existing quarries were depleted of good-quality aggregate materials. Quarrying efficiency was improved with new methods, new explosives, and new facilities. Secondary blasting was being replaced by drop hammers, the use of which reduced explosives consumption. In the Wellington area, new water recovery and re-use facilities were installed at quarries. Landsea Minerals Ltd. was granted prospecting rights to six areas offshore from the northern peninsula, North Island.

Stone.—Winstone Ltd. closed a large quarry at Whangarei, North Island, and reopened a nearby stone quarry (graywacke) at Otaika. Downer and Co. Ltd. was preparing a basalt quarry for production at Wiri and was phasing out a quarry at Roscommon.

Greenstone.—Recent production of greenstone for ornamental uses and the export market came from boulders in Olderog Creek, a tributary of the Arahura River, west coast, South Island. The boulders were reduced in size by diamond saw and transported by helicopter to processing areas.

Good quality greenstone was in short supply because of reduced gold-sluicing operations, which had been a major source.

Sulfur.—A separation process was under development at a sulfur-pumice deposit at Rotorau, North Island. Small production was derived from a pilot plant test operation.

MINERAL FUELS

In 1975 New Zealand imported 61% of the total energy it consumed. An energy conservation program, proposed by the Minister of Energy Resources in April, would reduce these imports to 20% to 30% by 1985, based on increased use of domestic coal and natural gas. The program also provided for interest-free loans for insulation, plans for improved insulation in government buildings, stricter insulation standards for new construction, 10-year loan financing to industry for costs of conversion from oil to coal-firing, increased use of public transportation, and reduced lighting and heating levels in government buildings. Shares of energy consumption, by consuming sector, were as follows: Industry, 39.1%; transport, 34.8%; residential and commercial, 24.6%; and nonenergy uses, 1.5%. Petroleum was the principal energy source, comprising 60.3% of total fuel consumption, followed by hydroelectric and geothermal (for electricity generation) (22.1%), solid fuels, mainly coal (14.7%), and natural gas (2.9%).

The Government acted to assume 50% State participation in any future energy resource development. Hydropower accounted for 85% of total electrical generation, although this source had substantial undeveloped potential. The Wairakei geothermal power scheme was capable of producing 130 megawatts, and the Broadlands Field had a generating potential of about 100 megawatts.

According to a report prepared by the Planning Committee on Electric Power Development, which forecast demand for electric power during 1975–90, growth in this demand cannot be met by existing conventional power sources, and nuclear power would probably be needed. The Committee recommended two 600-megawatt nuclear plants, the first of which would be operable by 1988, requiring a decision by 1978. Six possible sites on the North Island and one on the South Island were under consideration.

Coal.—Output, down 6% from 1974, was as follows, by type, in tons:

	Quantity
Bituminous	457,414
Subbituminous	1,818,530
Lignite	136,449
Total	2,412,393

There were 67 operating mines (71 in 1974), including 38 underground and 29 surface. About three-fourths of the mines were Crown operations; the remainder were small private operations. A number of mines were closed for various reasons—depleted reserves, safety, uneconomic—and new mines were opened.

Exploration drilling and trenching were underway in several districts. Most of the known coal reserves were in the Waikato-Taranaki District, North Island, the chief source of subbituminous coal. Large-scale exploration and development drilling were underway in the Waikato Valley to provide fuel for planned thermal power stations. The west coast, South Island, was essentially the only source of bituminous coal. The largest reserves of lignite were in the Otago-Southland District, South Island.

Productivity was increasing at the larger mines with increased mechanization and hydraulic mining. However, mining costs remained high, averaging $11.45 per long ton for underground mining and $5.60 per long ton for surface mining. Since investments in coal mine development had totaled only $25 million, a $27 million expansion program initiated in 1974, was a major boost to the industry. Production from Crown mines in the Huntly District, Waikato Valley, was expected to triple to more than 2 million tons per year, with three new mines (two underground, one surface). Underground development started in 1975. The mines will be fully mechanized, with continuous mining equipment and conveyor belt haulage to the Huntly power station, which was one of four large coal-fired thermal units planned on the North Island. The Huntly station, under construction in the new Huntly coalfield, will consume 500,000 tons of coal per year on one boiler in 1978 and more than 1 million tons per year by 1985. On the west coast of the South Island, a new coal-fired power station was also scheduled for operation in 1983.

In 1974, Ataki and Co. Ltd. (Japan), which had conducted coal exploration in New Zealand for several years, submitted a proposal for development and export of coking coal at Mount Davey, Greymouth area, South Island. In June 1975, the Government announced agreement in principle to a $17.7 million project for mining and shipment to Japan of 500,000 tons per year for a minimum of 15 years, subject to agreement on price, royalty, and other considerations. The coal would be hauled by conveyor belt system and rail to stockpiling and slurry shiploading facilities at Lyttleton, near Christchurch on the east coast. West Coast Resources Ltd. (Ataki 50%, New Zealand interests 50%) was established as the operating company.

Table 3.—New Zealand: Coal statistics

(Metric tons)

Year	Production		Employment	Imports	Exports
	Open pit	Underground	(Number of workers)		
1973	1,670,161	798,380	1,555	758	5
1974	1,758,813	805,501	1,581	250	37
1975	1,695,459	716,934	1,600	4,486	1,285

Source: State Coal Mines. Mines Statement for Year Ended Dec. 31, 1975.

Table 4.—New Zealand: Estimated recoverable coal reserves, by type, in 1975

(Thousand metric tons)

Type	Reserves			Total
	Measured	Indicated	Inferred	
Bituminous	36,104	23,703	71,550	131,357
Subbituminous	139,355	66,600	237,350	443,305
Lignite	10,580	17,100	233,300	260,980
Total	186,039	107,403	542,200	835,642

Source: Department of Statistics, Wellington. New Zealand Official Yearbook 1975.

Natural Gas.—Production continued to increase, with four new producing wells going into operation in the Kapuni gasfield, North Island. The Kapuni gas-processing plant was undergoing expansion. Kapuni gas consumption was mainly residential; small quantities were consumed by industry. Reserves were considered sufficient for 25 years.

The large, offshore Kaui gasfield, discovered 32 kilometers off the Taranaki coast, near Kapuni, in 1969, was under development to provide fuel for three power stations, under government contract starting in 1978. Condensate from the field was expected to supply 10% to 15% of the feedstock at the Marsden Point oil refinery. Natural gas reserves at Kaui were estimated at 5 trillion cubic feet of high-quality methane. In the $300 million first stage, the Shell Oil (New Zealand) Ltd.–Todd Oil Services Ltd. consortium, which had been developing the Maui Field since 1973, planned a production platform to deliver 600 million cubic feet per day and was laying gas and condensate pipelines. For the second stage, 1979–83, a second platform for 300 million cubic feet per day and additional pipelines were scheduled.

In October, the Minister of Energy Resources announced a more flexible gas-use policy, which would divert more Maui gas to domestic, commercial, and other industrial uses rather than unlimited use for electrical power generation. The National Gas Corp. was required to annually prepare a 5-year as well as a long-term development and marketing program.

Petroleum.—No crude petroleum was produced, but condensate production at the

Kapuni gasfield was substantially higher than that of 1974.

According to the Ministry of Mines, 61 petroleum prospecting licenses, comprising 622,311 square kilometers, both onshore and offshore, were operative at yearend. Geological and geophysical exploration was in progress in a number of areas, and drilling activity was increasing. For offshore drilling, two new rigs arrived in New Zealand waters during the year. Hunt International Petroleum Co. started drilling from the semisubmersible rig *Penrod 74* in February and planned a 2-year stay, including hiring by other exploration companies. Two wells were drilled for the Shell-BP-Todd consortium, 18 kilometers offshore from Taranaki, North Island, and in the Foveaux Strait, off the southern end of the South Island, near Stewart Island. The latter was in progress at yearend.

The offshore drill ship *Glomar Tasman,* owned by Global Marine Inc. of the United States, planned a stay of 1 to 1½ years after arriving at midyear. It completed dry wells offshore from Canterbury, east coast, South Island, and offshore from the Taranaki coast, North Island, and was drilling near Rugged Point, Stewart Island, at yearend. These wells were also drilled for the Shell–BP–Todd consortium.

Onshore, Republic Petroleum Corp. (New Zealand) Ltd., announced the purchase of a drill rig, which arrived at New Plymouth, North Island, in June and drilled two shallow wells in its Taranaki concession, which showed oil and gas indications.

The Petroleum Amendment Act of 1975, which rewrote and amended Part I of the Petroleum Act, became effective in September. It provided for greater government control over exploration and development, government participation in these and production operations, and stricter licensing procedures.

In March, the Minister of Energy Resources announced a plan to proceed with expansion of the Marsden Point refinery, New Zealand's only oil refinery, located on the east coast, northern peninsula, North Island, but details were not available at yearend. Ownership was divided as follows: Mobil Oil New Zealand Ltd. 19.2%, Shell Oil New Zealand Ltd. 17.1%, BP New Zealand Ltd. 15.1%, Caltex Oil (New Zealand) Ltd. 8.6%, Europa Oil (New Zealand) Ltd. 8.6%, and New Zealand public shares 31.4%.

The Mineral Industry of Nigeria

By Janice L. W. Jolly [1]

The importance of petroleum to Nigeria's economy in 1975 is revealed by the statistics: 92.8% of export value and about 47% of the 1975 gross domestic product, estimated at $25 billion.[2] Lower petroleum production in 1975, however, meant revenues fell short of the fund requirements previously projected for the development plan in 1975. The fall in production was attributed to declining world demand. Soaring labor costs, which added about 30% to the wage bill, a shortage and high cost of spare parts, and reduced metal prices all contributed to a difficult year for the mining industry. The shortage of spare parts was largely due to extreme port congestion, which reached a critical state toward yearend. By September 1975, 420 ships were waiting to enter Lagos port including a large number of cement vessels. The jam at Lagos harbor grew out of the purchase of 20 million tons of cement—at a cost of about $1 billion—with delivery stipulated to take place within a year. The tonnage was far in excess of port handling capacity. Inflation approached 50% in 1975 and continued at a similar rate through the first part of 1976. Inflationary pressures were traced to short supply of locally produced and imported goods, high prices of imports due to high foreign prices, higher freight rates, surcharges arising from port congestion, and domestic wage increases combined with low productivity.

Plans were being implemented to expand the industrial sector, requiring an outlay of nearly $10 billion to be allocated during the third development plan period (1975–80). Flaring of over 2 billion cubic feet of natural gas per day was to end with the construction over the next 5 years of two liquefied natural gas (LNG) and liquefied petroleum gas (LPG) facilities at Bonny and Escravos, costing together over $3.4 billion, by The Shell-British Petroleum Development Co. of Nigeria Ltd. (Shell-BP) and Phillips Oil Co. of Nigeria Ltd. and Nigerian AGIP Oil Co. Ltd. The Government was to hold a 55% equity in the two plants. Two new oil refineries were to be built for local use, each with 100,000 barrels per day capacity, one at Warri by Ente Nazionale Idrocarburi (ENI) and one at Kaduna. Capacity of the existing Port Harcourt refinery was to be expanded from 60,000 to 75,000 barrels per day, and two additional export-oriented refineries were to be built with a capacity of 300,000 barrels per day each. Other industrial projects already underway or planned included a $500 million petrochemicals complex at Port Harcourt; a $110 million nitrogenous fertilizer plant; a blast furnace complex at Ajaokuta; new or expanded power stations or generating units at Sapele, Afam, Delta, Eket, Kainji, Shiroro, Jebba, Gongola, and Ikom; expansion of cement plants at Ukpilla, Sokoto, and Calabar; expansion of the Enugu coal mine; and salt and superphosphates projects.

Mining activity of the third plan was heavily weighted toward petroleum. Approximately $3.2 billion was appropriated for petroleum out of the total $4.4 billion. Private mineral investment, estimated at nearly $2 billion, was also mostly petroleum oriented. With $118 million added for coal development, fossil fuel extraction was to consume nearly 97% of all allocations to the mining sector. Nonferrous mining and minerals development was expected to command more than $380 million in capital spending. Iron and steel development was slated for five times this investment level,

[1] Physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from Nigerian naria (N) to U.S. dollars at the rate of N1.00=US$1.62.

but was progressing more slowly. About $1.7 billion was earmarked in the plan for iron and steel projects.

Port development expenditures were expected to exceed the $350 million earmarked in the third plan. Port congestion loomed as the most severe transportation bottleneck threatening development progress. Port expansion was planned for Lagos/Apapa, Warri, Calabar, Port Harcourt, and Koko. More than one-fifth of all public outlays ($12 billion) was allotted for transportation improvements. The highway system was to get the greatest emphasis. The Federal and State Governments together were to undertake more than $7 billion in highway construction, with most of the activity scheduled in the first half of the plan period.

During 1975, the Federal Government awarded three airborne geophysical survey contracts. The areas to be covered were the Sokoto and Middle Niger region, the Chad Basin, and the Niger Delta and adjoining offshore areas. The three areas totaled about 396,000 square kilometers. Airborne magnetometers and airborne gamma ray spectrometers were to be employed during the survey. A report on a 144,500-square-kilometer survey of the north-central part of Nigeria completed by Hunting Geology and Geophysics of England was expected in early 1976. The area covered extended from the Niger border south towards Benue River and included the towns of Kano, Kaduna, Jos, and Zaria. Part of Hunting's contract included the training of Nigerian Geological Survey scientists in all aspects of airborne geophysics. The surveys were begun in late 1973. Complete coverage of Nigeria was the ultimate objective. The Geological Survey of Nigeria was calling for tenders for geochemical reconnaissance of certain parts of Nigeria. The Nigerian Mining Corp. (NMC) was investigating the Kigom molybdenite deposit, the Kogo tin-sphalerite lode, the Abakaliki lead-zinc deposit, and the Ilesha gold deposit.

PRODUCTION AND TRADE

Oil production declined from an average of 2.3 million barrels per day in 1974 to less than 1.5 million barrels per day by May 1975. Production had improved in the third quarter of 1975, and demand had improved sufficiently by the fourth quarter to enable Nigeria to successfully impose a price increase of more than the 10% agreed upon by the Organization of Petroleum Exporting Countries (OPEC). Crude oil production was 652.5 million barrels in 1975, down 20.9% compared with 823 million barrels produced in 1974.

Crude petroleum processed by Nigeria's only refinery, located at Alesa-Eleme near Port Harcourt, was about 19 million barrels in 1975. The Nigerian Petroleum Refining Co., Ltd. (NPRC), which operated the refinery, was owned 60% by Nigerian National Oil Co. (NNOC) and 40% by Shell-BP. NPRC accepted and processed crude on a fee basis from seven marketing companies including AGIP, BP, Esso Standard Nigeria, Ltd., Mobil Oil Nigeria, Ltd., Texaco Overseas (Nigeria) Petroleum Company, Total Oil Co. of Nigeria and the National Oil Marketing Co. (NOMCO) (formerly Shell Nigeria). The Government acquired a 60% interest in the Shell marketing company in April 1975 and the company's name was changed to NOMCO.

Tin and coal were Nigeria's principal mineral products after petroleum, but production of both declined in 1975. Nigerian tin production continued to decline for the seventh consecutive year, reaching the lowest level in 1975 since 1933. Total coal production for 1975 was 314,000 tons, about 13% more than in 1974. Slight production increases were recorded for cement, marble, and gold in 1975, but kaolin and columbite (a coproduct of tin mining) production decreased. Columbite production was 17% less than in 1974. Whereas tin prices weakened, columbite prices became firmer.

Total exports for 1975 were valued at $8.1 billion, compared with $9.4 billion in 1974. Petroleum exports were valued at $7.5 billion and tin exports at $28 million in 1975, compared with $8.9 billion (petroleum) and $29 million (tin) in 1974. Total imports (c.i.f.) for 1975 were valued at $6 billion. Nigeria and the German Democratic Republic signed a trade agreement on October 15, 1974, in which Germany was to buy crude oil and other minerals. On August 28, 1975, NNOC agreed to supply Senegal with 18.4 million barrels of crude annually. The 15-year contract was to begin January 1978.

The United States was taking a progressively higher proportion of Nigerian crude and less was being exported to Europe in 1975; demand in both areas was lower than in 1974. This shift in emphasis from European to U.S. markets for Nigerian crude was expected to continue because light low-sulfur, Nigerian crude commands a premium price at U.S. refineries designed to produce a high yield of gasoline.

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

Commodity	1973	1974	1975 p
METALS			
Columbium and tantalum:			
Columbite concentrate, gross weight	r 1,248	1,193	990
Tantalite concentrate, gross weight	1	1	1
Gold troy ounces	21	6	8
Lead, mine output, metal content e	r 350	220	130
Rare-earth metals, monazite concentrate	5	11	e 12
Tin:			
Mine output, cassiterite concentrate:			
Gross weight	7,884	7,372	6,286
Tin content	5,834	5,455	4,652
Smelter	5,983	5,574	4,677
Tungsten ore and concentrate, gross weight	3	(1)	(1)
Zinc ore and concentrate, metal content e	--	65	745
NONMETALS			
Cement, hydraulic thousand tons	1,222	1,238	1,364
Clays, unspecified	29,988	16,747	131,125
Feldspar e	5,000	5,000	5,000
Stone:			
Limestone thousand tons	1,801	1,655	1,631
Marble	8,631	4,240	5,488
Shale thousand tons	133	198	197
MINERAL FUELS AND RELATED MATERIALS			
Coal do	327	278	314
Gas, natural:			
Gross production million cubic feet	735,813	1,017,774	658,839
Marketed production do	10,700	14,255	16,094
Petroleum:			
Crude thousand 42-gallon barrels	r 749,820	823,347	651,890
Refinery products:			
Gasoline do	5,588	5,301	4,658
Jet fuel do	1,573	709	1,412
Kerosine do	1,574	2,209	2,587
Distillate fuel oil do	4,881	4,767	3,801
Residual fuel oil do	6,100	6,487	5,695
Lubricants do	--	--	469
Other:			
Liquefied petroleum gas do	174	160	115
Unspecified do	--	--	1,522
Refinery fuel and losses do	959	820	259
Total do	20,849	20,453	20,518

e Estimate. p Preliminary. r Revised.
1 Less than ½ unit.

Table 2.—Nigeria: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Columbium and tantalum, ore and concentrate	1,145	2,277	Japan 1,292; United Kingdom 387; United States 352.
Iron and steel, metal scrap	282	628	United Kingdom 355; Brazil 152.
Lead, ore and concentrate	314	242	All to Belgium-Luxembourg.
Tin:			
Ore and concentrate	--	1	All to United Kingdom.
Metal, including alloys, all forms	5,251	5,762	United Kingdom 4,135; Netherlands 1,497.
Tungsten ore and concentrate	1	--	
Zinc:			
Ore and concentrate	110	1,230	All to United Kingdom.
Metal including alloys	20	--	
Zirconium, ore and concentrate	--	87	United Kingdom 82.
Other nonferrous base metals, n.e.s.:			
Ore and concentrate	1,955	2,205	Netherlands 1,188; Equatorial Customs Union [1] 490.
Scrap	8,769	8,089	United Kingdom 5,154; Netherlands 1,067.
NONMETALS			
Abrasives, grinding and polishing wheels and stones	(2)	--	
Fertilizer materials, crude	6	(2)	All to Sierra Leone.
Lime	--	538	All to West Germany.
Sodium and potassium compounds n.e.s., ammonia and caustic potash	--	268	Ghana 263.
Stone, sand and gravel	46	--	
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	457	8,896	Equatorial Customs Union [1] 8,260; Netherlands 450.
Coal and coke, including briquets	25,541	17,214	All to Ghana.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	698,779	714,599	United States 204,437; United Kingdom 115,742; Netherlands 94,816.
Refinery products:			
Gasoline do	468	117	Equatorial Customs Union [1] 70; Niger 22; Dahomey 21.
Jet fuel do	197	226	U.S.S.R. 114; Equatorial Customs Union [1] 92.
Kerosine do	11	26	Equatorial Customs Union [1] 24.
Distillate fuel oil do	414	398	Equatorial Customs Union [1] 147; Niger 125.
Residual fuel oil do	1,095	570	United States 548; Niger 8.
Lubricants do	7	12	Ghana 7; Dahomey 1.
Mineral jelly and wax do	--	(2)	All to Equatorial Customs Union [1].
Nonlubricating oils n.e.s. do	--	(2)	All to Netherlands.
Bitumen and bituminous mixtures, n.e.s do	127	3	Niger 2.
Total do	2,319	1,352	

[1] Consists of the Congo, Central African Republic, Chad, and Gabon.
[2] Less than ½ unit.

Table 3.—Nigeria: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum, metal and alloys:			
Unwrought	350	1,258	Canada 1,000; West Germany 130.
Semimanufactures	8,355	15,043	West Germany 3,342; Switzerland 3,284; United States 1,807; France 1,701.
Copper, metal and alloys:			
Unwrought	27	232	Canada 230.
Semimanufactures	2,905	3,410	United Kingdom 1,084; West Germany 782; Canada 765.
Iron and steel:			
Ore and concentrate including roasted pyrite	3,920	--	
Metal:			
Scrap	1	157	United States 154.
Pig iron including cast iron	185	60	United Kingdom 53.
Sponge iron including powder and shot	51	3,807	Bulgaria 3,612.
Spiegeleisen	(1)	129	Japan 60.
Ferroalloys	160	306	United Kingdom 184; West Germany 43.
Steel, primary forms	r 84,928	114,406	West Germany 60,096; United Kingdom 26,364.
Semimanufactures	656,257	1,021,149	Japan 218,816; West Germany 202,056; United Kingdom 153,722.
Lead, metal including alloys:			
Unwrought	808	51	United Kingdom 50.
Semimanufactures	230	213	United Kingdom 171.
Nickel, metal including alloys:			
Unwrought	1	(1)	All from Czechoslovakia.
Semimanufactures	37	171	United States 131; United Kingdom 20.
Platinum-group metals and silver:			
Ore and concentrate	--	22	All from West Germany.
Metal including alloys, all forms:			
Platinum group thousand troy ounces	(1)	(1)	Mainly from Israel and West Germany.
Silver do	2	(1)	Mainly from West Germany.
Tin, metal including alloys:			
Unwrought	7	21	United Kingdom 20.
Semimanufactures	61	188	Yugoslavia 93; Hungary 60.
Uranium and thorium:			
Ore and concentrate	--	3	All from Sweden.
Metal including alloys, all forms	1	--	
Zinc metal including alloys:			
Unwrought	4,763	2,841	Zaire 2,142; United Kingdom 693.
Semimanufactures	57	580	Zaire 463; United Kingdom 115.
Other:			
Ore and concentrate of base metals, n.e.s	223	48	Sweden 36; United Kingdom 12.
Metals, nonferrous, including alloys, all forms, n.e.s	13,328	6,446	Zaire 3,905; United Kingdom 910; Canada 737.
NONMETALS			
Abrasives:			
Natural	6,280	465	United States 376.
Grinding and polishing wheels and stones	424	649	United Kingdom 420; West Germany 66.
Asbestos	32,190	46,178	Canada 32,468; West Germany 5,097.
Cement, hydraulic	854,549	1,045,603	U.S.S.R. 219,465; Greece 191,195; West Germany 170,296.
Clays and clay products (including all refractory brick)	10,166	19,934	West Germany 3,944; United Kingdom 3,220; Italy 3,151.
Diamond, industrial value, thousands	r $128	$123	India $121.
Fertilizer materials:			
Crude	23,784	29,346	West Germany 14,676; Netherlands 7,453; Belgium-Luxembourg 4,055.
Manufactured:			
Nitrogenous	8,515	8,528	Netherlands 3,792; West Germany 3,116; Belgium-Luxembourg 1,000.
Phosphatic	40,902	73,018	West Germany 19,511; Belgium-Luxembourg 17,444; Japan 15,385.

See footnotes at end of table.

Table 3.—Nigeria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured—Continued			
Potassic	10,767	1,443	Netherlands 1,160.
Other	776	800	Netherlands 580; Belgium-Luxembourg 140.
Ammonia	737	1,018	Japan 394; United Kingdom 285; West Germany 273.
Lime	16,015	16,853	Turkey 5,906; United Kingdom 5,878; West Germany 2,512.
Mica, all forms	561	270	United Kingdom 139; Italy 79.
Pigments, mineral, including processed iron oxides	2,969	3,446	United Kingdom 2,078; West Germany 683.
Precious and semiprecious stones except diamond [2] value, thousands	$124	$246	India $245.
Salt, excluding brine	200,586	181,650	United Kingdom 119,292; Poland 30,597; West Germany 24,939.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	16,571	23,382	West Germany 13,378; United Kingdom 3,495.
Caustic potash, sodic and potassic peroxides	4,213	6,120	United Kingdom 2,664; France 1,612; West Germany 1,029.
Stone, sand and gravel:			
Worked	6,775	592	Italy 351; France 104.
Gravel and crushed rock	34,191	13,834	Morocco 12,241; United States 1,045.
Sulfur, all types, other than sublimed	457	468	United Kingdom 446.
Other nonmetals, n.e.s.:			
Crude	217	3,362	Netherlands Antilles and Surinam 2,376.
Building materials of asphalt, asbestos and fiber cement and unfined nonmetals, n.e.s	15,568	30,016	United Kingdom 7,269; U.S.S.R. 6,266; West Germany 6,241.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	234,041	135,599	Greece 50,350; Netherlands Antilles and Surinam 20,121.
Coal and coke including briquets	1,703	4,952	United Kingdom 4,044.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	22	--	
Refinery products:			
Gasoline do	509	2,730	Italy 624; Netherlands Antilles and Surinam 544; Iran 535.
Kerosine do	84	257	Italy 72; Libya 33; Netherlands Antilles and Surinam 33.
Jet fuel do	135	553	Netherlands Antilles and Surinam 167; Italy 137; Netherlands 114.
Distillate fuel oil do	51	745	Netherlands Antilles and Surinam 173; Netherlands 173; Italy 157.
Residual fuel oil do	9	6	Netherlands Antilles and Surinam 5.
Lubricants do	280	442	United Kingdom 225; Netherlands Antilles and Surinam 109.
Mineral jelly and wax do	73	39	Netherlands 16; United Kingdom 10; West Germany 9.
Bitumen and bituminous mixtures do	2,494	581	Netherlands Antilles and Surinam 239; Netherlands 149.
Other do	14	11	United States 5; United Kingdom 3; Netherlands 2.
Total do	3,649	5,364	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	43,908	934	United Kingdom 613; United States 186.

[1] Less than ½ unit.
[2] Includes pearls.

COMMODITY REVIEW

METALS

Columbium and Tantalum.—With lower tin production, output of columbium concentrates, a coproduct of tin mining, fell to about 990 tons. Although tin prices weakened, columbite prices became firmer, $2 per pound of pentoxide for the first time in many years. The principal sources of columbite output were Bisichi-Jantar, Vectis Mines, and Amalgamated Tin Mines of Nigeria Ltd. (ATMN), with 381, 356, and 174 tons, respectively. Supplies to users were further obstructed by shipping congestion at Lagos, which reduced shipments to almost nil by yearend.

Gold.—Toward yearend 1975, arrangements were finalized for a geochemical survey to determine the presence of gold in the Ilesha area of Western State. Starting in January 1976, the initial survey was to be geochemical, followed by pitting and drilling. Exploration was to cover 382,000 square kilometers and extend to Birnin, Bwari, and Osi in North Central, North Western, and Kano States, respectively. Gold was not found in appreciable quantity in Nigeria, although small amounts were recovered from streams. Formerly the most important producing areas were in Niger, Zaria, and Sokoto areas, but the major part of output in 1975 came from the Ilesha and Oyo areas where stream sediment panning had been fairly extensive.

Iron and Steel.—The Government announced that the planned Nigerian iron industry would start production in 1985 with technical aid from the Soviet Union. The first meeting was held in March 1975 to discuss the Soviet preliminary report for the iron and steel project. Representatives of the Soviet export-import organization for steel industry construction projects, members of the French consulting firm SOFRASID, and Nigerian officials discussed the Soviet report. The Soviet recommendation for completion of all geological surveys before starting detailed plant design was rejected, and it was suggested that plant capacity be increased from the original 1 million tons per year planned, since current needs and the expected consumption growth rate were to require far more by 1985, the suggested year of startup. The blast furnace complex was to be erected in Ajaokuta in the Kwara State and was to initially produce 1 million tons of steel per year. Two direct reduction plants with a total capacity of about 1 million tons sponge iron per year were also to be constructed during the 1975–80 national development plan using abundant natural gas. Sites had not yet been selected. Nigerian planners estimated the country could absorb 3.2 million tons of steel annually by 1985—almost 2 million more than the blast furnace capacity.

The Nigerian Steel Development Authority announced that some 200 million tons of iron ore had been discovered in the Itakpe Hill area of Kwara State. The ore contains 37% to 41% iron as magnetite and hematite in a quartz gangue. Deposits with average iron content of 40% and 50% were also discovered at Agbaja near the confluence of the Niger and Benue Rivers, and at Enugu. Reserves of these ores were estimated at 30 million tons and 45 million tons, respectively.

Two Japanese companies were forming a joint venture with Nigerian and British interests for production of small-diameter welded pipes in Lagos. The company, called Standard Industrial Development, was to be capitalized for $17 million with 17% held by Mitsubishi Corporation and 10% by Kobe Steel, Ltd. The remaining 73% was held by Nigerian and British companies. The plant was to start up in 1977; the 1,000- to 1,200-ton monthly production of pipe was to be used in gas and municipal water supply projects. A scrap metal processing plant was to be established by the Lagos State Government, costing $4 million. The Nigersteel factory at Emene, in East Central State, which was destroyed during the civil war, was fully reactivated at a cost of $6.5 million. The annual output of the factory was estimated at 15,000 tons. An expansion scheme estimated to cost $64.8 million was to be started by Bendel Steel Structures Ltd., Warri, Midwestern State. The Nigerianization of existing foreign-controlled steel companies began. Pioneer Metal Products, a producer of galvanized sheets and largely owned by Japan's Marubeni Corp., agreed to increase local holdings to 40% and accept Nigerians as executives. Galvanized Industry, in which Yodogawa Steel Works, Ltd. and C. Itoh & Co., Ltd. of Japan had holdings, was to take in 20% Nigerian capital, later to be expanded to 40%.

Lead and Zinc.—Lead-zinc mineralization extends discontinuously for about 563 kilometers in a narrow belt in Ishiagu and Bende in East Central State and also in Bauchi Province in North Eastern State. The most important deposits were found in Abakaliki, where NMC had been exploring. As an incentive to miners, the Federal Government declared the mining of lead-zinc by underground methods to be a pioneer industry, thereby providing generous tax-free periods.

Tin.—Tin export control was in force throughout the year, but this had no effect on Nigeria's output because production did not reach the country's quota. Poor demand for tin on the world market was compounded by rising labor costs, labor scarcity, and rising power and production costs. A wage compromise arrangement was concluded between the Employers Association and the Trade Unions, enabling operators in the tin industry to stay in business. It was estimated that the increase in the wage bill during the year was $256,000 to ATMN after introduction of the Udoji wages award at the beginning of 1975. Nigeria's Makeri tin smelter was at a standstill early in 1975 as a result of a strike called in support of a 200% pay rise, following a management offer of 30%. Makeri Smelting Company Limited had 17,700 tons per year capacity.

A government organization, the NMC, continued its search for minerals throughout 1975 and explored the possibility of participation with established companies such as ATMN and the Makeri Smelting Co. A new 22-story headquarters building was being constructed for NMC, scheduled for occupation by mid-1978. NMC arrived at a settlement with Gold & Base Metals Mines of Nigeria Ltd. (GBMM) on the development of the Liruie lode in Kano State. The NMC was to be the largest shareholder in the new company, Ririwar Mines Ltd., with GBMM holding 20% interest. Mine development was to cost about $32 million, including a treatment plant for 900 tons of ore per day. During 1975, GBMM produced 383 tons of cassiterite and 9 tons of columbite. The latest ore reserve estimates for Liruie follow: Measured, 351,000 tons; indicated, 2,478,000 tons; and inferred, 3 million tons.

ATMN produced 2,604 tons of cassiterite during 1975 and 174 tons of columbite. The company purchased two bucket wheel excavators and about 2 miles of conveyor system costing more than $1.6 million. Delivery of the excavators was delayed by the backlog of ships at Nigeria's main port. Both excavators were to work tin deposits in the Sabon Gida area, about 150 feet deep, in conjunction with draglines to remove the overburden. The first tin ore from these operations was to be recovered by mid-1976. The operation would be the deepest opencast mining venture on the Jos Plateau.

United Tin Areas announced proved reserves on their plateau areas at only 40 tons of cassiterite, scarcely adequate for 6 months' production. The company disposed of more than half of its mining leases to Vectis Mines and ceased columbite production.

NONMETALS

Cement.—Nigeria had six cement factories: The Calabar Cement Co. at Calabar in South Eastern State; the West African Portland Cement Co. (WAPC) at Ewekoro in Western State; Lagos Cement Works; the Cement Co. of Northern Nigeria Ltd. at Sokoto; Nigerian Cement Co. Ltd. at Nkalagu in East Central State; and a plant at Ukpill in Mid-Western State. Their entire production did not exceed 1.4 million tons, including 750,000 to 800,000 tons from Ewekoro and 500,000 tons from Nkalagu. Extensions for the plants at Sokoto and Calabar were in progress and were to enable them to attain total production of about 1 million tons for both by 1978. The Nigerian Cement Co. at Nkalagu awarded a $9.7 million contract to Costain West Africa Ltd. for an extension to the plant there. This was part of a $43.7 million expansion planned by the company to step up its present production by 50% to 750,000 tons annually. New cement plants planned or started also included one at Ashaba with WAPC; one at Yandei with the Swiss group Cementia; and one at Shegamu with the Industrial investment and Credit Corp., the Government of Western State, and WAPC. The whole of these operations was to provide supplemental production of 1.8 million tons to Nigeria, each with a capacity of 600,000 tons per year. The foundation stone for the $96 million cement plant at Shagamu was laid in July 1975. The cement complex was situated at Kilometer 64 on the Lagos-Shagamu road. Production was to start in

1977 with about 1,500 people employed. An asbestos cement plant with 30,000 tons annual capacity was inaugurated in March 1975 in Oron, South Eastern State, by the Italian firm Technimpianti.

The Government had ordered 20 million tons of cement in 1975 to be delivered within 12 months. At a rate of 1.6 million tons per month, the import shipments proved to be more than twice the unloading capacity of all of Nigeria's ports combined. The massive orders led to an armada of ships anchored off Lagos; by September 1975 more than 420 freighters were waiting. Some ships waited for 8 months to a year. The cement lost its binding quality after 6 months and became worthless for construction; even so, millions of tons of the ruined cement found its way to small contractors. Estimates were that as much as half the cement went bad. It was widely speculated that in 2 or 3 years buildings might collapse as a consequence. Ironically, by 1976, shortages of cement were reported and the price rose 30%. The economic repercussions of clogging at the ports were severe in closing down factories that could not get parts, in preventing vital exports, and in feeding the inflation rate.

Clays.—About 2.7 million tons of clay was discovered at Awkunanaw near Enugu in March 1974.[3]

Fertilizer Materials. — *Phosphate.* — A study was to be made of the phosphate deposits of southwestern Nigeria, which are an extension of the Togo phosphates. The total cost of all exploration programs to be undertaken by the Nigerian Government and specialist groups was estimated at $15 million. Hunting Geology and Geophysics and Polservice (Pologne) were to participate in geophysical studies. In 1975, Nigeria had no fertilizer production facilities of its own, but an 18,000-ton-per-year P_2O_5 single-superphosphate plant was nearing completion at Kaduna in Central North State. The plant was being financed and built with Japanese aid and was to utilize phosphate rock from Togo. Fertilizers were heavily subsidized by the Nigerian Government, up to 70% of the total cost, but supply was restricting consumption. Fertilizers were procured by the State Governments, and the poor distribution system within the country was probably the major problem hindering efficient supply.

Stone.—*Limestone.*—A reserve of about 32 million tons of limestone was reported in the Lokoja area of Kwara State.

MINERAL FUELS

Coal.—The main coal mines were at Enugu in East Central State, but a new mine was opened in Okabba in Kwara State in 1974. The Nigerian Coal Corp. (NCC), a Government organization responsible for the mining and distribution of coal, announced the possibility of a new coalfield near Lafia in Benue Plateau State. It was reported that the estimated reserves near Lafia were in excess of 100 million tons. The coal had a relatively high sulfur and ash content and would require considerable dressing before coking. The main consumers of coal were the Railway Corporation, the Electricity Corporation of Niger, the Nigerian Ports Authority, cement companies, and firms operating river boat fleets. An $8 million contract for the sale of 2.5 million tons of coal for export was signed in July 1974 between the NCC and an indigenous company, the United National Co., Nigeria Ltd., Lagos.[4]

Coal reserves were estimated at about 245 million tons. Consideration was being given to establishing a chemical industry based on coal or lignite. Carbonization tests have revealed a high yield of tars and oils. Promising lignite for development occurs on both sides of the River Niger between Okpanam in the Benin area and Nnewi in the Onitsha area. Reserves of 71 million tons were indicated in Benin by drilling.

Petroleum.—Only OPEC's African members Algeria, Libya, and Nigeria showed a decrease in per-barrel revenues in 1975. Estimated Nigerian Government oil revenue was approximately $6.6 billion for 1975, compared with $8.9 billion for 1974, a decrease of 26%.[5] The fall in petroleum production experienced in 1975 was attributed to declining world demand and to a policy of production conservation. It was also argued that Nigerian crude was overpriced in relation to other OPEC oil of similar quality. Demand had so improved by the fourth quarter of 1975 that Nigeria felt confident in raising its price by more than the 10% agreed upon by OPEC in Oc-

[3] Daily Times of Nigeria Ltd. (Apapa, Nigeria). Nigeria Yearbook 1975, November 1973 to October 1974, p. 21.
[4] Page 36 of work cited in footnote 3.
[5] Petroleum Economist (London). Estimated Oil Exports and Revenues of Main OPEC Countries. V. 43, No. 9, September 1976, p. 338.

tober. The Government's across-the-board price for its 55% of Nigerian oil production (buy-back oil) reached $12.75 per barrel, the highest in OPEC for that grade of oil. Earlier in 1975, troubled by persistent decline in crude oil production and exports, and the consequent erosion in oil revenues, the Nigerian Government had moved to make its crude more competitive by reducing its direct sale (to buyers who did not produce oil in Nigeria) and buy-back prices by 20 cents to $11.40 per barrel for 34° gravity crude. The income tax rate on equity crude (producers' remaining 45% of production) was also raised to 85% from the previous 65.7%, while the royalty rate was increased to 20% from 16-2/3% in April 1975. By yearend 1975, in two separate moves, the Government had increased oil revenues, pushing up the average buy-back price by about 38 cents per barrel. By increasing selling and posted prices, the Government reduced company profit margins from 50 cents to 30 cents per barrel, bringing them closer to Middle East levels. Producing companies claimed that the increases would bring cash-flow problems, pointing out that the investment per barrel of production is higher in Nigeria than in the Middle East. The posted price for the first quarter of 1976 was to be $13.709, raised from $13.071 per barrel for 34° gravity crude. The Government also imposed restrictions on credit terms extended to oil producing companies, which had a 90-day credit on buy-back oil. The companies were being given 60 days' credit from the date of loading and asked to pay an additional 10 cents per barrel should they require a further 30 days' credit.

While the Government was successful in raising the price in late 1975, the producing companies considered the margin allowed per barrel too low in the face of inflated capital costs to justify large new investments and substantially reduced their exploration activities. Drilling rigs in operation declined gradually but steadily all year from 27 at the beginning of 1975, and many were taken out of the country by yearend. By 1976, drilling rigs in operation were down to 15, and Japan Petroleum Co. (Nigeria), Ltd., canceled one rig in spite of stiff penalty payment clauses. Occidental Petroleum Nigeria's entire investment in Nigeria was written off in 1975. After a number of unsuccessful attempts to negotiate an arrangement whereby the firm's discovery on oil prospecting license 90 could be economically developed, Occidental relinquished interest in this block and wrote off the remaining oil investment of approximately $33.3 million. Three other Nigerian offshore exploratory blocks had been relinquished in 1974.

All exploration rights not already allocated were reserved for NNOC, giving it almost a third of offshore concessions. NNOC was also entitled to drill in deep water outside existing concession areas and owned some onshore rights. Including NNOC, 14 companies were prospecting for oil. The others were Nigerian Agip Oil Company, Limited; Gulf Oil Company (Nigeria) Limited; Mobil Producing Nigeria, Phillips Oil Company (Nigeria) Ltd.; Safrap (Nigeria); Shell-BP Petroleum Development Co. of Nigeria Ltd.; Tenneco Oil Company of Nigeria; Ashland Oil Co. (Nigeria); Deminex (Nigeria) Ltd.; Japan Petroleum Company (Nigeria) Ltd.; Pan Ocean Oil Co., Ltd.; Texaco Overseas (Nigeria) Petroleum Company Ltd.; and Henry Stephens and Sons Ltd. (owned by Chief Fajemirokun). Some were in partnership: Phillips was in partnership with Agip; Pan Ocean with Delta; Texaco with Tenneco; and Ashland with NNOC. In January 1975, a petroleum deposit of apparently high quality was discovered in West Central State by the Mobil-Tenneco-Sun Oil consortium. An onshore strike in midwestern Nigeria was also reported by Pan Ocean. The well, Ogharefe No. 3, tested 14,674 barrels of oil and 16.5 million cubic feet of gas per day from three separate zones between 9,830 and 10,350 feet. The gravity of the oil ranged from 43° to 45° API with a negligible sulfur content. The well was located 32 kilometers south of Benin City in Mid-West State.

Through NNOC, the Government held a 55% share in the Nigerian operations of Shell-BP, Gulf, Mobil, Agip-Phillips, Essence et Lubrifiant de France (ELF) and Texaco, the main producer companies. Ashland Oil, which began production in June 1975, was the only company operating under a production-sharing contract with NNOC, representing the startup of NNOC's "own" oil production. Ashland began production from its onshore Izombe oilfield at an initial rate of 10,000 barrels per day and had a target of 20,000 barrels per day by the end of 1975. Ashland was to recover costs from a portion of production, and the remaining production up to 50,000 barrels per day was to be split 65%–35% in favor of NNOC. The split was to increase to 70%–30% on production over 50,000 barrels per day. The field was found in early 1974, located in Block OPL 118 in the Oguta division of East Central State. Oil from Izombe was produced from six wells through a flow station into the 10-inch Izombe-Ebocha pipeline to the Brass River coastal terminal. Ashland was drilling a wildcat in an offshore production contract area. Texaco increased production sharply to 9,210 barrels per day in November 1975. Texaco/Chevron's offshore fields were suspended from production of Government orders in May 1974, pending outcome of negotiations which were held through much of 1975 to give a 55% participation to the Government. The company expected to be producing 20,000 barrels per day by yearend 1975 and to reach 50,000 barrels per day in 1976.

Seven foreign-owned oil companies marketed all refined petroleum products consumed locally except for LPG. An agreement giving the Government majority interest (60%) in Shell Nigeria was negotiated. The new company was called National Oil Marketing Co. and had legal authority to market petroleum. The only refinery in Nigeria was owned and operated by Nigerian Petroleum Refining Co. Ltd., which was owned 60% by the Government, 20% by BP, and 20% by Shell. The Government has determined that future refineries will be 100% Government-owned, although others may operate them.

Nigerian gasoline consumption soared almost 30% in 1974 to 20,000 barrels per day. Gasoline shortages have become a chronic problem. Notable disruption of petroleum supplies occurred throughout the country over much of 1975. Domestic marketing of oil products was chaotic despite efforts by the marketing companies and some emergency actions by Government. Striking truck drivers caused a shortage of petroleum products in mid-January, and Nigeria's only refinery was shut down for maintenance throughout February. The problem of supply was compounded by smuggling (since the controlled price in Nigeria was lower than in neighboring countries), hoarding, and profiteering. Transport fares and haulage prices also soared. The Government outlined immediate short-term measures to arrest the shortages and commissioned a team of experts to find the cause or causes of frequent fuel shortages. Minirefineries, able to handle 5,000 barrels of oil per day, were to be set up, and oil storage facilities were to be built throughout the country. A $6 million contract was signed with Norway's Det Norsek Oljeselskap (Texas subsidiary, Val Verde Corp.) for two portable minirefineries to go into operation by mid-1976. The capacity of the Port Harcourt refinery was to be expanded to 75,000 barrels per day by the installation of a skid-mounted mobile distillation unit capable of refining 20,000 barrels of crude per day. Other measures included the construction of new jetties and the expansion of existing ones to handle the offloading of larger quantities of imported petroleum products and an increase in the fleet of road tankers. There were also indications of other refining and pipeline contracts being privately negotiated on a crash basis to accelerate projects to solve the distribution problem.

The Government approved establishment of two LNG/LPG gas plants with capacity of 1 billion cubic feet per day each; they were expected to cost over $2 billion each. These were first introduced during the second development plan, but were expected to be implemented during the third plan. One would be built at Bonny (Rivers State) and would have Shell/BP as the Government's partner. The other would be built either on the southern bank of Escravos River in Mid-West State or in some other more suitable locality and would incorporate an ethylene complex with Phillips and AGIP as partner. The Federal Government would have 60% participation in each plant and 50% in the LNG tanker fleet. The Government would establish, own, and operate an integrated gas-gathering company to serve all gas projects.

The third development plan included a $486 million investment in a petrochemical complex near Port Harcourt. The following capacities were tentatively recommended,[6] pending negotiations: Ethylene 100,000 tons per year; caustic soda, 40,000 tons per year; vinyl chloride, 40,000 tons

[6] European Chemical News (London). ECN New Projects. V. 27, No. 691, June 20, 1975, p. 18.

per year; PVC, 40,000 tons per year, and polyethylene, 40,000 tons per year. The ethylene plant was planned for expansion in the future to 250,000 tons per year. It was also recommended that a 1,400-ton-per-day ammonia plant and a 10,500-ton-per-day methyl fuel plant be incorporated into the complex. Production was expected to begin by 1978. A nitrogenous fertilizer facility was also planned utilizing gas. Plans called for producing 450,000 tons per year of ammonia and 260,000 tons per year of urea. These plants were to be situated near the Port Harcourt complex and were to utilize tail gas to supplement the natural gas feedstock. A completion date of 1977 was hoped for project completion. Scientific Design of the United Kingdom signed a contract to act as consultant, and approximately $113 million was to be spent on the two projects. Two new oil refineries were to be established at Warri and Kaduna with capacities of 100,000 barrels per day and 70,000 barrels per day, respectively. The Warri refinery was to include catalytic cracking facilities and an aromatics separation unit. In addition, two export-oriented refineries each with 250,000 barrels per day capacity were to be built.

The Mineral Industry of Norway

By Joseph B. Huvos [1]

In 1975, Norway, with its sizable hydroelectric resources, continued as one of the world's major producers of aluminum, magnesium, and ferroalloys. Owing to recent North Sea discoveries, Norway was also on its way to becoming one of Europe's major oil producers. The most important mineral products of the country, with approximate percentages of world totals, were as follows: Ilmenite (20), magnesium (16), nickel (6), cobalt (4), aluminum (5), and pyrite (3). Production of other metals, minerals, and fuels, important only to the national economy, included copper, pig iron, steel, lead and zinc, vanadium, sand and gravel, cement, feldspar, fertilizer materials, nepheline syenite, quartzite, sulfuric acid, and some coal and peat.

In 1975, Norway's gross national product (GNP) was about $27 billion.[2] Of this total, the oil and coal industries contributed about $1 billion; the iron, steel, and ferroalloy industries, $850 million; nonferrous metals, $1.2 billion; and nonmetallic minerals, $500 million. Out of a total mining and industry employment of about 400,000 persons in 1975, the iron, steel, and ferroalloy industries employed about 16,000; the nonferrous metal industry, 13,000; the mineral-product industry, 9,000; and the petroleum and coal industries, about 2,000.

Norwegian mining companies have been affected to varying degrees by the current international recession and higher oil prices, depending on the commodities produced. Most affected by market conditions were production of cupriferous pyrites and ilmenite. Iron ore and pellet production have profited from recent price rises. Most other mineral products were subject to little change. On balance, the mining industry production index increased about 1%.

The bulk of Norway's mining production is exported to West European countries. Main import items were bauxite and alumina, mostly from Surinam and Guinea; nickel matte from Canada; coal and coke from various sources; and crude oil or products from the Middle East and West European countries.

There were a number of significant developments in 1975. New mining capacity came onstream at Titania A/S, Hauge I Dalane ilmenite mine in the north of the country. Work also continued on the expansion of the company's Frederikstad pigment plant on Oslo Fjord. In the petroleum industry, production started at the 4-million-ton-per-year Mongstad refinery in Karmøy, West Norway. The 350-kilometer pipeline from Ekofisk to Teeside, England, started to carry oil. Development drilling began in the West Ekofisk area. Norway also became a net exporter of oil and petroleum products in 1975.

Norwegian oil policy aims at increasing state control and intervention in all phases of petroleum activity; following this policy, the Government concluded an agreement to purchase British Petroleum's Norsk Braendselolje A/S, a production and distribution subsidiary, in 1975 and carried out a number of other minor purchases.

The Government also purchased the DNN Aluminium A/S, 25,000-ton-per-year Tyssedal reduction plant and approved a 25% excess profit tax on oil and gas products.

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[1] Physical scientist, International Data and Analysis.

[2] Where necessary, values in Norwegian kroner (NKr) were converted to U.S. dollars at the rate of NKr5.2269=US$1.00 for 1975 and NKr5.542=US$1.00 for 1974. Source of conversion rate for 1974 and 1975 was International Monetary Fund.

PRODUCTION

The following tabulation shows preliminary indices of production for various sectors of the mineral industry:

Industry sector	(1970=100)	
	1974	1975
Mining and quarrying:		
Coal mines	94	84
Metal mines	106	111
Other mining and quarrying [1]	108	117
Manufacturing:		
Iron, steel, ferroalloys	120	122
Nonferrous metals	125	110
Ceramics, glass, glassware	118	105
Chemical raw materials	119	108
Refining of petroleum and coal	112	130
Electric power	133	133

[1] Includes production of crude oil and natural gas.

Source: Statistik Sentralbyra, Olso. Statistisk, Manedshefte. V. 93, No. 12, 1975, pp. 19–23.

Production of mineral commodities is shown in table 1.

Table 1.—Norway: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Aluminum metal:			
Primary ingot	r 623,292	648,213	590,885
Secondary ingot	33,301	13,126	12,100
Superpure	3,500	4,700	4,700
Cadmium, smelter	88	90	47
Cobalt, metal	912	1,238	773
Copper:			
Mine output, metal content:			
In copper concentrate	r 22,245	20,336	27,451
In cupriferous pyrite	r 7,702	3,784	1,583
Total	r 29,947	24,120	29,034
Metal:			
Primary:			
Blister	r 34,648	31,737	26,348
Refined	r 25,815	24,807	19,674
Secondary	6,274	8,319	e 10,000
Iron and steel:			
Iron ore and concentrate thousand tons	3,970	3,904	4,089
Roasted pyrite do	142	166	e 170
Pig iron do	r 698	648	638
Ferroalloys:			
Ferrochrome do	r 30	31	27
Ferromanganese do	r 235	336	331
Ferrosilicon (75% basis) do	r 304	310	302
Ferrosilicomanganese do	r 107	187	200
Other do	r 15	10	10
Total do	r 691	874	870
Steel, crude do	r 951	956	914
Semimanufactures:			
Rolled do	r 707	685	e 660
Finished castings do	15	20	e 20
Lead, mine output, metal content	r 3,335	3,376	3,200
Magnesium metal, primary	r 37,528	39,795	38,290
Molybdenum, mine output, metal content	105	--	--
Nickel:			
Concentrate, metal content	r 448	536	e 330
Metal, primary	r 42,715	43,224	37,056
Platinum-group metals (exports) troy ounces	38,742	30,833	46,972
Silicon, elemental (exports)	55,742	63,931	49,748
Titanium:			
Ilmenite concentrate	752,934	848,138	526,904
Dioxide e	18,000	18,000	23,000
Vanadium, mine output, metal content e	r 740	770	1,030
Zinc:			
Mine output, metal content	r 19,249	22,036	24,145
Metal, primary	r 80,954	72,434	60,596
NONMETALS			
Cement thousand tons	r 2,726	2,638	2,791
Feldspar, lump [1]	256,707	168,116	e 170,000
Fertilizer materials, manufactured:			
Nitrogenous:			
Fertilizer, gross weight thousand tons	1,025	922	NA
Elemental nitrogen (total) do	627	635	495
Potassic do	5	4	NA
Compound and other do	1,168	1,251	NA
Ammonia do	708	936	NA
Graphite	r 6,891	9,698	9,375
Lime (quicklime and hydrated lime)	r 118,177	115,192	e 100,000
Mica (exports)	4,445	4,158	3,577
Olivine sand	r 238,261	315,358	NA
Pyrite and pyrrhotite:			
Gross weight	788,335	658,626	472,935
Sulfur content	r 363,658	314,199	e 218,000
Sodium and potassium compounds, n.e.s.:			
Caustic soda	75,561	73,155	69,816
Sodium carbonate	18,726	20,467	e 21,000
Stone:			
Dimension stone:			
Syenite (labrador)	72,868	56,458	NA
Slate	78,775	72,930	NA

See footnotes at end of table.

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

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Stone—Continued			
Crushed and broken stone:			
Dolomite:			
Ground	101,924	80,527	NA
Not further described	465,587	506,894	NA
Limestone thousand tons	4,960	5,174	NA
Nepheline syenite	200,313	211,982	313,220
Quartz and quartzite	672,446	785,046	NA
Other thousand tons	[2] 1,179	[2] 877	NA
Sulfur, sulfuric acid (100%)	r 382,295	380,842	332,828
Talc, soapstone, steatite:			
Unground	65,390	52,883	NA
Other	71,047	60,143	NA
Total	136,437	113,026	e 120,000
Other nonmetals, n.e.s., oxides and hydroxides of magnesium, strontium, and barium	29,149	27,251	NA
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades thousand tons	r 412	461	389
Coke, all grades do	r 323	313	260
Gas, manufactured million cubic feet	1,003	875	878
Peat:			
For agricultural use e	r 40,800	r 56,400	60,000
For fuel use e	r 1,200	r 1,200	1,200
Petroleum:			
Crude thousand 42-gallon barrels	11,166	12,707	68,900
Refinery products:			
Gasoline, motor do	6,069	6,001	7,702
Jet fuel do	1,616	1,392	1,703
Kerosine do	1,372	829	1,056
Distillate fuel oil do	14,532	16,114	19,862
Residual fuel oil do	17,036	15,058	17,306
Lubricants do	266	98	58
Other do	3,293	4,173	5,254
Refinery fuel and losses do	3,089	1,888	3,290
	47,273	45,553	56,231

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Excludes nepheline syenite.
[2] Excludes a quantity of stone only reported volumetrically as: 1973—4,722,646 cubic meters; 1974—4,525,996 cubic meters; and 1975—NA.

TRADE

In 1975, Norway continued to run a trade deficit. However, the increasing Norwegian production of crude oil is expected to generate a trade surplus in 1976.

Nonferrous metals (mainly aluminum and nickel), ferroalloys, rolled steel, and liquid fuels were again major export items in 1975 and accounted for about three-quarters of the total value of all mineral commodity exports. Imports of liquid fuels, iron and steel, basic chemicals (mainly alumina and aluminum hydrate), and metallic ores (mainly nickel-copper matte) accounted for approximately four-fifths of the mineral commodity imports in 1975.

Trade in mineral commodities in 1973 and 1974 is detailed in tables 2 and 3.

Table 2.—Norway: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Alumina	100	9	Mainly to Switzerland.
Metals including alloys:			
Scrap	8,941	12,805	West Germany 6,137; Sweden 2,083; Netherlands 1,235.
Unwrought	576,131	554,513	West Germany 129,871; United Kingdom 127,629; Netherlands 53,846.
Semimanufactures	54,937	40,688	Sweden 11,079; United Kingdom 8,467; Denmark 7,702; Finland 4,079.
Antimony	1	--	
Arsenic	(1)	--	
Cadmium	80	59	NA.
Chromium oxide and hydroxide	1	1	NA.
Cobalt	723	1,172	NA.
Copper:			
Ore and concentrate	63,841	52,964	West Germany 25,284; Sweden 15,905; Finland 6,165.
Oxide and hydroxide	2,166	2,173	Taiwan 34; Finland 20.
Copper sulfate	--	--	
Metal including alloys:			
Scrap	1,076	2,152	Belgium-Luxembourg 766; West Germany 749; Sweden 263; United Kingdom 224.
Unwrought:			
Unrefined	7,633	6,290	West Germany 5,520; East Germany 720.
Refined	26,796	25,777	Sweden 4,104.
Semimanufactures	3,186	1,955	Sweden 1,008.
Gold metal, unworked or partly worked troy ounces	3,569	2,154	Denmark 1,157; West Germany 418; United Kingdom 386.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	2,988	2,657	West Germany 1,217; United Kingdom 873; Poland 281.
Roasted pyrite	174,524	152,508	West Germany 134,518.
Metal:			
Scrap	24,538	34,446	Spain 20,140; West Germany 7,825; Sweden 6,460.
Pig iron including cast iron	140,167	121,301	United Kingdom 41,129; West Germany 21,860.
Ferroalloys:			
Ferromanganese	225,254	309,365	United Kingdom 74,534; West Germany 58,854; Sweden 41,642.
Other	472,169	527,408	West Germany 140,072; United Kingdom 109,793; Belgium-Luxembourg 46,085.
Steel, primary forms	231,248	212,460	Netherlands 140,684; Denmark 40,396; West Germany 19,971.
Semimanufactures:			
Bars, rods, angles, shapes, sections	244,030	193,475	Sweden 42,227; United Kingdom 42,204.
Universals, plates, sheets	102,061	129,461	Sweden 64,689; Denmark 19,122.
Hoop and strip	3,563	8,463	Sweden 5,023; Denmark 3,290.
Rails and accessories	1,259	975	Spain 600; Sweden 213; Finland 144.
Wire	10,947	8,769	United Kingdom 1,398; Portugal 1,205; Switzerland 775; Iran 746.
Tubes, pipes, fittings	36,599	33,244	Sweden 1,151.
Castings and forgings, rough	12,763	14,002	Sweden 10,649; Denmark 1,847; Liberia 1,406.
Total	411,222	388,389	
Lead:			
Ore and concentrate	6,533	6,015	Netherlands 5,648.
Oxides	12	26	Libya 10; Japan 10; Thailand 6.
Metal including alloys:			
Scrap	4,554	4,748	Denmark 2,748; Sweden 1,558.
Unwrought	520	366	Sweden 121; France 100; Denmark 75.
Semimanufactures	212	164	Mainly to Sweden.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Magnesium metal including alloys:			
Unwrought ---- value, thousands --	$31,502	$45,311	NA.
Wrought	196	260	Netherlands 143; Sweden 108.
Manganese ore and concentrate	3,030	1,831	Sweden 1,020; United Kingdom 811.
Mercury ---- 76-pound flasks --	464	58	Mainly to Denmark.
Molybdenum:			
Ore and concentrate	218	--	
Metal including alloys, all forms	(1)	1	Mainly to Austria.
Nickel:			
Ore and concentrate	11,535	13,515	All to Finland.
Matte, speiss, and similar materials	2	--	
Metal including alloys:			
Scrap	240	309	West Germany 247; United Kingdom 27.
Unwrought	43,254	43,810	United States 15,807; West Germany 6,657.
Semimanufactures	1	13	United States 8; Denmark 3.
Platinum-group metals and silver:			
Waste and sweepings - kilograms --	52,421	57,051	West Germany 39,104; United Kingdom 13,875; Sweden 8,358.
Metal including alloys:			
Platinum-group metals troy ounces --	38,742	30,833	United States 17,329; Netherlands 6,302; West Germany 3,151.
Silver ---- do ----	668,188	862,443	Sweden 663,337; Denmark 166,187.
Rare-earth metals:			
Oxides	4	8	Mainly to United States.
Metals including alloys, all forms ---- value --	$172	--	
Silicon, elemental	55,742	63,931	United Kingdom 15,888; U.S.S.R. 14,533; West Germany 13,997; United States 7,471.
Tin metal including alloys:			
Scrap	39	54	United Kingdom 34; Denmark 20.
Unwrought	223	284	Sweden 237; Finland 39.
Semimanufactures	7	8	Finland 6.
Titanium:			
Ore and concentrate (ilmenite)	684,660	776,814	NA.
Oxides	1,226	900	Sweden 623; Denmark 191.
Tungsten metal including alloys, all forms ---- value --	$1,548	$3,339	Mainly to West Germany.
Uranium and thorium metal including alloys, all forms ---- do ----	$19,608	$28,882	Mainly to Denmark.
Zinc:			
Ore and concentrate	14,888	20,488	Poland 8,362; Netherlands 7,352; Belgium-Luxembourg 4,774.
Oxide	923	560	Sweden 317; Denmark 205.
Metal including alloys:			
Scrap	133	371	Sweden 125; West Germany 116; France 91.
Blue powder	2,899	459	NA.
Unwrought	67,387	55,238	Sweden 22,062; United Kingdom 16,702; West Germany 6,868; France 4,848.
Semimanufactures	597	873	Sweden 317; Netherlands 102; Denmark 91; West Germany 88.
Other:			
Ash and residue containing nonferrous metals	6,691	22,932	West Germany 11,145; United Kingdom 3,351.
Oxides, hydroxides and peroxides of metal, n.e.s	21	2	NA.
Metal including alloys:			
Metalloids, n.e.s	11	10	United States 7.
Pyrophoric alloys, value, thousands --	$2	$3	NA.
Base metals including alloys, all forms, n.e.s	33	23	West Germany 8.
NONMETALS			
Abrasives, natural, n.e.s., grinding and polishing wheels and stones	1,079	1,140	Sweden 238; Poland 209; Finland 206; Iran 63.
Asbestos	1	73	Mainly to Sweden.
Barite and witherite	52	75	Do.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Boric oxide and acid	11	--	
Cement, hydraulic ---- thousand tons	1,042	876	United States 566; Ghana 242.
Chalk	1	2	NA.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	261	302	Sweden 239; Denmark 38.
Products:			
Refractroy (including nonclay bricks)	8,006	8,560	West Germany 5,845; Sweden 887.
Nonretractory thousand tons	r 1,051	1,389	West Germany 1,172; France 223.
Diamond, gem, not set or strung value, thousand	$5	$6	Netherlands $4; Switzerland $1.
Diatomite and other infusorial earth	14	15	NA.
Feldspar and related materials	286,835	325,683	West Germany 83,321; United Kingdom 71,971; Netherlands 55,230.
Fertilizer materials:			
Manufactured:			
Nitrogenous	853,893	811,049	NA.
Phosphatic	18	25	NA.
Potassic	11	12	Mainly to West Germany.
Other	776,306	788,552	NA.
Ammonia ------ value, thousands	$11,291	$12,350	NA.
Graphite, natural	8,038	9,570	NA.
Gypsum and plasters	14,026	13,368	Ghana 12,310; Liberia 1,044.
Lime	81	--	
Mica, crude including splittings and waste	4,445	4,158	West Germany 883; Netherlands 524; France 491; Sweden 417.
Pigments, mineral, processed iron oxide	35	49	Thailand 22; Libya 12.
Precious and semiprecious stones except diamond --------- value, thousands	$3	$7	Mainly to Belgium-Luxembourg.
Pyrite (gross weight)	486,198	410,573	West Germany 262,267; Sweden 116,791.
Salt	3,538	3,430	Denmark 1,385; Sweden 1,269; Canada 760.
Sodium and potassium compounds, n.e.s ------------ value, thousands	$137	$453	NA.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Marble and other calcareous	3,331	3,697	Italy 2,017; West Germany 867; Sweden 567.
Slate	r 50,650	45,876	Netherlands 21,321; Denmark 7,225; West Germany 5,473.
Other	87,899	100,557	France 28,949; Italy 27,748; West Germany 20,990.
Worked, all types	146	22	NA.
Dolomite	92,547	16	NA.
Gravel and crushed rock thousand tons	1,049	1,180	West Germany 867; United Kingdom 145; Sweden 104.
Limestone (except dimension)	18,712	32,800	Denmark 19,975; West Germany 5,479; Sweden 5,180.
Quartz and quartzite	5,031	4,548	Denmark 1,782; West Germany 1,715.
Sand, excluding metal bearing	2,608	3,007	Mainly to Ivory Coast.
Sulfur:			
Elemental	r 86	68	Mainly to Sweden.
Sulfur dioxide	675	777	Sweden 591; Denmark 186.
Sulfuric acid -- value, thousands	$1,951	$2,532	NA.
Talc, steatite, soapstone, pyrophyllite	69,129	66,883	Sweden 14,059; United Kingdom 14,029; West Germany 9,672; Denmark, 7,741.
Other nonmetals, n.e.s.:			
Crude	73	131	Mainly to West Germany.
Slag, dross and similar waste, not metal bearing	18,323	2,842	Do.
Oxides and hydroxides of magnesium, strontium and barium	NA	--	
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals, n.e.s	10,784	2,235	Denmark 2,140.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	121	652	Iceland 602.
Carbon black	20	6	NA.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coal and coke, including briquets:			
Anthracite and bituminous coal	80,317	54,042	West Germany 49,048.
Coke and semicoke	51,436	70,840	United States 65,056.
Peat, including peat briquets and litter	1	5	NA.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	11,398	13,874	Denmark 6,454; Sweden 2,422; United Kingdom 1,918; West Germany 1,666.
Refinery products:			
Gasoline, including natural do	3,153	3,329	Sweden 2,799.
Kerosine and jet fuel do	922	93	Mainly to Denmark.
Distillate fuel oil do	2,675	3,327	Sweden 3,014.
Residual fuel oil do	9,018	8,012	Sweden 3,210; Finland 1,951; United Kingdom 1,665.
Lubricants do	141	77	Denmark 28; United Kingdom 22; Sweden 10; France 7.
Mineral jelly and wax do	1	(1)	NA.
Other:			
Liquefied petroleum gas do	343	269	United Kingdom 139; Sweden 58; Denmark 35; Belgium-Luxembourg 23.
Nonlubricating oils, n.e.s do	14	12	Mainly to Sweden.
Bitumen and other residues do	1	(1)	NA.
Bituminous mixtures, n.e.s do	(1)	(1)	NA.
Petroleum coke do	(1)		
Pitch do	(1)	(1)	NA.
Total do	16,268	14,228	
Mineral tars and other coal-, petroleum-, gas-derived crude chemicals	19,445	20,434	Netherlands 8,640; West Germany 4,344; Denmark 3,134; Spain 2,783.

r Revised. NA Not available.
[1] Less than 1/2 unit.

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

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite	3,151	6,576	Greece 5,431; Sweden 641; Guyana 504.
Alumina	1,256,426	1,287,505	Jamaica 593,772; Surinam 289,078; United States 151,964; Australia 76,182.
Metal including alloys:			
Scrap	1,226	168	Portugal 129; Iceland 39.
Unwrought	32,427	27,911	Sweden 9,842; U.S.S.R. 8,476; Hungary 2,961; United States 1,953.
Semimanufactures	20,952	34,451	West Germany 11,366; Sweden 6,331; Switzerland 4,022; Finland 3,911.
Antimony metal including alloys	88	35	Belgium-Luxembourg 10; People's Republic of China 7; Brazil 5.
Arsenic trioxide, pentoxide and acid	107	80	Mainly from Sweden.
Chromium:			
Chromite	87,150	86,204	Turkey 71,929; U.S.S.R. 10,686; Greece 3,245; Finland 273.
Oxide and hydroxide	209	160	West Germany 117.
Metal including alloys, all forms	(1)	3	Mainly from United States.
Cobalt:			
Oxide and hydroxide	15	24	Belgium-Luxembourg 23.
Metal including alloys, all forms	9	5	Mainly from Belgium-Luxembourg.
Copper:			
Oxide and hydroxide	240	135	Finland 100; West Germany 30.
Copper sulfate	--	1,479	U.S.S.R. 700; Belgium-Luxembourg 338; Sweden 310.
Metal including alloys:			
Scrap	5	285	United States 239; Iceland 27.
Unwrought	969	1,703	United Kingdom 1,001; Belgium-Luxembourg 260; Sweden 156.
Semimanufactures	27,614	30,005	Sweden 13,185; United Kingdom 5,474; West Germany 4,954.
Gold metal, worked or partly worked troy ounces	34,080	26,878	United Kingdom 15,593; West Germany 8,938.
Iron and steel:			
Ore and concentrate	43,802	13,773	Mainly from Sweden.
Scrap	26,475	50,995	West Germany 12,145; Denmark 9,771; Poland 7,558; Sweden 7,136.
Pig iron, ferroalloys and similar materials	15,425	33,050	Sweden 11,906; West Germany 4,776.
Steel, primary forms	141,360	167,625	Netherlands 125,231; Sweden 14,605.
Semimanufactures:			
Bars, rods, angles, shapes, sections	333,092	398,311	West Germany 117,303; France 60,737; Belgium-Luxembourg 56,576; Sweden 52,739.
Universals, plates, sheets	682,132	897,122	West Germany 231,917; Japan 200,597; Sweden 101,303; Belgium-Luxembourg 86,363.
Hoop and strip	42,995	54,553	West Germany 16,802; Belgium-Luxembourg 14,043; Sweden 8,919; France 7,532.
Rails and accessories	8,829	11,342	Sweden 8,732; Austria 983; Belgium-Luxembourg 765.
Wire	11,285	13,929	Sweden 4,519; Belgium-Luxembourg 3,803; West Germany 2,065; United Kingdom 1,739.
Tubes, pipes, fittings	117,727	178,553	West Germany 69,829; United Kingdom 34,036; France 21,680; Sweden 14,048.
Castings and forgings, rough	1,302	1,874	Sweden 376; United Kingdom 326; Austria 293; Denmark 224.
Total	1,197,362	1,555,684	
Lead:			
Oxides	779	932	West Germany 377; United Kingdom 339; Sweden 168.

See footnote at end of table.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Lead—Continued			
Metal including alloys:			
Scrap	258	68	United Kingdom 15; Japan 15.
Unwrought	12,584	13,703	United Kingdom 6,861; Sweden 2,861; Republic of South Africa 1,865.
Semimanufactures	1,163	1,247	Netherlands 556; Belgium-Luxembourg 243; West Germany 192; France 149.
Magnesium metal including alloys:			
Unwrought ---- value, thousands	$1,094	$2,228	U.S.S.R. $183.
Wrought	17	28	Mainly from West Germany.
Manganese:			
Ore and concentrate	714,776	1,033,047	Republic of South Africa 238,068; Gabon 227,371; Brazil 207,127; Ghana 89,179.
Oxides	764	967	Netherlands 451; People's Republic of China 330; Belgium-Luxembourg 112.
Metal including alloys, all forms	693	934	Republic of South Africa 758.
Mercury ---- 76-pound flasks	174	138	Sweden 116.
Molybdenum metal including alloys, all forms	11	--	
Nickel:			
Matte, speiss, similar materials	89,646	93,243	Canada 89,489.
Metal including alloys:			
Scrap	15	--	
Unwrought	55	718	Canada 343; Dominican Republic 214; France 117.
Semimanufactures	340	302	United Kingdom 143; United States 71; West Germany 55.
Platinum-group metals and silver:			
Waste and sweepings kilograms	8,965	14,205	Sweden 7,558; United States 3,460; Denmark 1,874.
Metal including alloys:			
Platinum group troy ounces	8,488	10,513	United Kingdom 5,530; West Germany 3,955; Switzerland 868.
Silver thousand troy ounces	3,556	3,397	West Germany 1,247; United Kingdom 1,243.
Silicon, elemental ---- value	$30,960	(1)	NA.
Tantalum metal including alloys, all forms ---- do	$688	$902	NA.
Tin:			
Oxide	2	1	NA.
Metal including alloys:			
Scrap	39	72	United Kingdom 42; Sweden 29.
Unwrought	599	795	United Kingdom 562; Denmark 105; Netherlands 80.
Semimanufactures	493	527	United Kingdom 384; West Germany 88.
Titanium:			
Ore and concentrate	245	75	Mainly from Australia.
Oxide	1,605	806	West Germany 576; United Kingdom 145.
Tungsten metal including alloys, all forms	1	1	NA.
Uranium and thorium:			
Oxides including rare-earth oxides	108	27	United Kingdom 13; West Germany 7; Japan 4; United States 3.
Metals including alloys, all forms value, thousands	(1)	--	
Zinc:			
Ore and concentrate	121,120	86,805	Sweden 55,961; Australia 18,606.
Oxide and peroxide	2,336	2,337	East Germany 1,042; West Germany 651; Poland 300.
Metal including alloys:			
Scrap	2,818	2,279	Sweden 1,767; Denmark 456.
Blue powder	r 2,289	2,114	France 1,980.
Unwrought	759	3,549	Poland 2,464.
Semimanufactures	2,095	1,323	France 808; West Germany 300.
Other:			
Ore and concentrate	724	2,120	Australia 2,056.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Other—Continued			
Ash and residue containing nonferrous metals	985	2,434	Belgium-Luxembourg 1,541; Sweden 797.
Oxides, hydroxides, peroxides of metals, n.e.s	257	20	United Kingdom 11; West Germany 6.
Metals including alloys, all forms:			
Metalloids	15	20	Sweden 15.
Alkali, alkaline earth, rare-earth metals	67	75	United Kingdom 52; Austria 20.
Pyrophoric alloys	3	3	United Kingdom 1; United States 1; Australia 1.
Base metals including alloys, all forms, n.e.s	43	67	United Kingdom 23; Sweden 22; United States 13.
NONMETALS			
Abrasives:			
Pumice, emery, natural corundum	5,227	7,636	Iceland 4,428; West Germany 2,965.
Dust and powder of natural or synthetic precious or semi-precious stones, except diamond ---------- kilograms	31	61	United Kingdom 57; Netherlands 4.
Grinding and polishing wheels and stones	972	979	Austria 259; United States 199; Sweden 158.
Asbestos	4,748	5,892	Canada 2,686; U.S.S.R. 2,450.
Barite and witherite	33,525	60,387	Netherlands 21,499; Ireland 21,184.
Boron materials:			
Crude natural borates	3,377	4,520	United States 2,385; Netherlands 1,127; West Germany 550; Turkey 458.
Oxide and acid	380	113	United States 35; Netherlands 30; West Germany 22.
Cement, hydraulic	11,245	5,058	United Kingdom 1,902; Denmark 1,878; West Germany 548.
Chalk	8,811	8,564	Denmark 3,218; Sweden 2,612; France 2,019.
Clays and clay products:			
Crude clays:			
Fuller's earth, dinas, chamote	784	914	United States 394; West Germany 344; United Kingdom 116.
Kaolin	85,406	86,521	United Kingdom 85,135.
Other	41,420	63,894	United Kingdom 25,907; Greece 13,370.
Products:			
Refractory	25,402	32,953	Sweden 8,946; United Kingdom 8,195; Austria 5,748; West Germany 4,257.
Nonrefractory ------- value	$5,306	$7,104	Netherlands $1,853; East Germany $1,272; Sweden $1,268; Japan $858.
Cryolite and chiolite	4,762	4,700	Mainly from Denmark.
Diamond:			
Gem, not set or strung thousand carats	5	10	Belgium-Luxembourg 1; Republic of South Africa 1.
Industrial --------------- value	$1,032	$1,444	NA.
Diatomite and other infusorial earth	1,259	1,422	Iceland 711; United States 345; Denmark 168.
Feldspar	66	30	NA.
Fertilizer materials:			
Crude:			
Phosphatic	403,925	418,001	U.S.S.R. 206,156; United States 75,529; Morocco 60,445; Israel 56,294.
Potassic	19	--	
Manufactured:			
Nitrogenous	1,948	2,060	West Germany 1,258; Denmark 519; Poland 170.
Phosphatic	15,110	16,411	Sweden 13,164; Belgium-Luxembourg 3,023.
Potassic	247,937	268,769	France 98,100; Spain 74,484; West Germany 54,380; Israel 20,251.
Other	12,230	8,526	Sweden 8,234.
Ammonia	29,149	35,910	Netherlands 25,997.

See footnote at end of table.

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Fluorspar	32,960	41,173	United Kingdom 28,395; East Germany 7,001; Spain 4,230.
Graphite, natural	181	493	United Kingdom 413; Sweden 72.
Gypsum and plasters	248,135	241,729	France 135,656; Poland 91,068.
Lime	17,923	15,134	Denmark 13,961.
Magnesite	4,290	5,310	People's Republic of China 1,727; Czechoslovakia 1,298; Austria 922; United Kingdom 732.
Mica, worked and unworked, all forms	3,295	4,098	India 3,152; Republic of South Africa 404.
Pigments, mineral:			
Natural, crude	177	109	West Germany 38; Austria 27; Spain 20.
Iron oxide, processed	2,899	3,785	West Germany 2,385; Netherlands 931.
Precious and semiprecious stones, except diamond, including synthetic stone kilograms	398	538	West Germany 174.
Salt and brine	311,993	336,299	NA.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	49,073	51,162	Belgium-Luxembourg 25,525; Netherlands 18,544.
Caustic potash, sodic and potassic peroxides	801	890	Sweden 561; West Germany 136; France 133.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	248	389	Sweden 227; Italy 43.
Slate	3,734	2,555	Sweden 2,213; East Germany 342.
Other	8,089	21,653	Sweden 18,858; Portugal 2,168.
Worked, all types	4,489	7,203	Portugal 6,000; Sweden 660.
Dolomite	2,878	3,341	Sweden 1,636; West Germany 1,257; United Kingdom 437.
Flint	592	1,048	Denmark 626; France 426.
Gravel and crushed rock	55,357	46,222	Sweden 45,162.
Limestone	255,393	261,007	United Kingdom 248,795.
Quartz and quartzite	243,971	302,116	Spain 152,053; Portugal 70,773; Sweden 69,572.
Sand excluding metal bearing	185,530	206,046	Belgium-Luxembourg 110,512; Sweden 53,033; Netherlands 17,300.
Sulfur:			
Elemental	20,735	22,081	Poland 17,110; France 2,875.
Sulfur dioxide	8,817	11,502	Mainly from Sweden.
Sulfuric acid	37,109	57,746	Poland 25,937; Sweden 6,977; United Kingdom 6,531; Denmark 6,474.
Talc, steatite, soapstone, pyrophyllite	5,063	3,352	India 1,722; People's Republic of China 590.
Other, n.e.s.:			
Crude	67,009	71,802	West Germany 66,948.
Slag, dross, and similar waste, not metal bearing	58,568	49,140	Sweden 43,898.
Oxides and hydroxides of magnesium, strontium, and barium	1,409	1,664	Netherlands 963; France 208; East Germany 180; United Kingdom 167.
Building materials of asphalt, asbestos, and fiber cement and unfired nonmetals, n.e.s	8,819	10,963	Sweden 2,730; United Kingdom 2,011; Belgium-Luxembourg 1,756; Finland 1,091.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	414	266	Mainly from United States.
Carbon black	4,893	5,163	Sweden 2,768; West Germany 1,608.
Coal, all grades, including briquets thousand tons	415	547	Poland 225; United States 167; United Kingdom 102.
Coke, all types do	577	706	United Kingdom 505; West Germany 158.
Peat, including peat briquets and litter	4,880	7,037	Sweden 5,325; Denmark 1,373.

See footnote at end of table.

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

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	52,136	47,103	Iran 2,260; United Arab Emirates 1,784.
Refinery products:			
Gasoline including natural do	7,684	6,333	Libya 2,100; United Kingdom 1,250; Netherlands 1,131; Belgium-Luxembourg 935.
Kerosine and jet fuel do	3,364	2,806	United Kingdom 1,186; Netherlands 512; Belgium-Luxembourg 372; Italy 256.
Distillate fuel oil do	12,690	10,071	United Kingdom 4,446; Netherlands 2,200; Belgium-Luxembourg 1,223.
Residual fuel oil do	5,201	4,649	Netherlands 1,685; United Kingdom 526; Denmark 513; Belgium-Luxembourg 466.
Lubricants do	471	511	United Kingdom 154; Sweden 119; Denmark 91.
Mineral jelly and wax do	65	79	West Germany 47; U.S.S.R. 16.
Other:			
Liquefied petroleum gas do	108	116	Sweden 81; United Kingdom 12.
Nonlubricating oil, n.e.s do	110	35	Sweden 7; France 7.
Bitumen and other residues do	1,125	1,139	Netherlands 345; Denmark 248; Belgium-Luxembourg 224; Sweden 103.
Bituminous mixtures, n.e.s do	14	12	NA.
Petroleum coke do	1,784	1,881	United Kingdom 176; Netherlands 77.
Pitch and pitch coke do	558	559	West Germany 314.
Total do	33,174	28,191	
Mineral tars and other coal-, petroleum-, or gas-derived crude chemicals	19,527	25,538	United Kingdom 15,128; Poland 5,801.

NA Not available.
[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—In 1975, five companies smelted mainly imported alumina in eight primary aluminum reduction plants with a total capacity of about 690,000 tons per year:

1. A/S Årdal og Sunndal Verk (ÅSV), owned 75% by the Norwegian State and 25% by Alcan Aluminium Ltd., Canada, operated a 175,000-ton-per-year plant at Årdal, on the Sognefjord; a 120,000-ton-per-year plant at Sunndalsøra, southeast of Kristiansand; and a 30,000-ton-per-year plant at Hoyanger, also on the Sognefjord.
2. Norsk Hydro A/S, Oslo, owned 51% by the Norwegian State and 49% by diverse other companies, operated a 120,000-ton-per-year plant at Karmøy, south of Haugesund.
3. Mosal Aluminium A/S, owned in equal parts by Elkem-Spiegerverket A/S, Oslo, and the Aluminum Co. of America (Alcoa), operated a 100,000-ton-per-year plant at Hosjoen, near Frederikstad, and a 50,000-ton-per-year plant at Lista, west of Mandal.
4. Sør Norge Aluminium A/S operated a 70,000-ton-per-year plant at Husnes, near Skanevik.
5. DNN Aluminium, owned in equal parts by Alcoa and British Aluminium Ltd., operated the 25,000-ton-per-year Tyssedal plant.[3]

In 1975, the Norwegian parliament approved the purchase of DNN Aluminium by the Norwegian State for $35 million from its present owners. Rights to hydroelectric power for the plant were also purchased.

The Norwegian Government was moving ahead with plans to use North Sea oil revenue to restructure the country's aluminum industry, with the emphasis placed on producing prefabricated and processed products rather than exporting primary metal. A 10-year diversification program was developed by the Ministry of Industry, providing for heavy capital investments in both production and marketing facilities by the three state-controlled aluminum companies of Norway.[4]

Copper, Lead, and Zinc.—In 1975, 9 companies operated 10 major mines producing complex sulfide ores. Lately a surplus of pyrite concentrates has caused a change in ore-dressing trends and, in 1975, most copper was produced as copper concentrate instead of cupriferous pyrite.

Much of the copper concentrate produced was exported to West European countries; only a small share of the total was fire-refined or converted to cathodes at the Kristiansand refinery of Falconbridge Nikkelverk A/S.

According to the Norwegian Ministry of Commerce, export restrictions on nonferrous metal scrap and waste, excluding lead and zinc, remained in effect in 1975. Licenses were not granted if there was a domestic buyer at the prevailing market price.

Iron Ore.—In 1975, four companies operated one iron ore mine each. Norway's known reserves of iron ore, with an Fe content exceeding 30%, are estimated officially at 800 million to 1,000 million tons, of which about 300 million tons are accessible by surface mining.[5]

Among the individual companies involved in iron ore mining was A/S Sydvaranger, holder of the Bjørnevatn mine, the largest in the country. The mine, located 5 miles south of Kirkenes, accounted for 14 million tons of ore and rock excavated. The ore was processed into 2.3 million tons of iron ore pellets. However, the pellet plant's capacity exceeds mining capacity at the mine. Therefore, the company plans to increase its mining capacity in the next 4 to 5 years to cover pellet capacity. In the meantime, there are plans to import a total of 300,000 tons per year of iron concentrate from the U.S.S.R. (shipped via Murmansk), if an earlier trial shipment of 10,000 tons proves suitable for pelletizing.

Sydvaranger has applied to the Norwegian Ministry of Industry for an allocation of natural gas from the Ekofisk gasfield in the North Sea to supply a direct-reduction plant it plans to set up at Emden, West Germany. The 1.5-million-ton-per-year plant, to become operational by 1980, is to cost $35 million. Korf Industrie und Handel and Sydvaranger

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[3] Aluminium (Düsseldorf). V. 51, Nov. 12, 1975, p. 806. Engineering and Mining Journal. November 1973, p. 130.

[4] American Metal Market. Oct. 31, 1975.

[5] U.S. Embassy, Oslo, Norway. State Department Airgram A-201, Nov. 12, 1974, p. 1.

have joined forces for this project. At another project, Sydvaranger has applied to the Ministry of Industry for supplies of 350 million cubic meters of natural gas from the Frigg gasfield, to be landed at Karmøy Island, West Norway, for eventual direct reduction of one-half of Sydvaranger's iron ore production into prereduced pellets with an Fe content of 92% to 93%. For this purpose, Sydvaranger has taken over production facilities and land holdings of Vignes Kobberverk near the planned landing site for Frigg gas on Karmøy.

Elsewhere, A/S Norsk Jernverk, a wholly-owned subsidiary of the Norwegian State, operated the nation's second-largest iron ore mine at Rana near Mo. About 2.3 million tons of hematite and magnetite ore was produced; total material mined, including overburden, was about 10 million tons. Work continued also at Rana on the Ortfjell ore body. Open pit production from Ortfjell is scheduled to begin in 1976 and is to provide the bulk of Rana ore by 1980. Proven reserves were estimated at 150 million tons averaging 32% Fe (including 4% in the form of magnetite).

Other Norwegian iron ore production included 100,000 tons of magnetite concentrate at the Elkem-Spigerverket A/S Rødsand mine, and 1.1 million tons of ore yielding 500,000 tons of magnetite concentrate and 5,000 tons of flotation pyrites from a 1,170-meter-deep shaft at the Fosdalens Berkwerks-AB Malm mine located on the Trondheimsfjord.

Iron and Steel.—In 1975, Norway had three major steelmaking companies. The state-owned A/S Norsk Jernverk operated the Mo-I-Rana plant, the largest in the country. Pig iron capacity was 600,000 tons per year, to be increased to 650,000 tons per year; steel capacity was 800,000 tons per year. There were six electric ironmaking furnaces, two 40-ton oxygen converters, three 80-ton electric arc furnaces, and a steel rolling mill. Raw material was domestic iron ore.

Norway's second-largest steelmaker was the Hydalen plant of Elkem-Spigerverket. The minimill-type operation uses mainly local scrap fed preheated into two arc furnaces. Capacity was 175,000 to 185,000 tons per year, mostly low alloy or carbon steels. Elkem-Spigerverket also operated four smaller plants including those of Stalogttau in Tønsberg, Mandal, and Stavanger, and that of Sinterco in Larvik.

Ferroalloy production was a major part of the Norwegian metals industry. There were 14 ferroalloy-producing units in the country, 8 for ferrosilicon, and the rest for ferromanganese and other special alloys. A typical example of a ferrosilicon-production unit is the Salten Verk of Elkem-Spigerverket, near Bodø, north of the Arctic Circle. The plant produces 80,000 tons per year of 75% ferrosilicon. Power supply is by a private 110-megawatt hydroelectric station.

Magnesium.—Norway's entire magnesium output came from the Norsk Hydro A/S plant, Porksgrunn Fabrikker, at Herøya in Telemark. Capacity of the plant was about 38,500 tons per year of primary metal from seawater and magnesite. Work continued at Herøya on construction of a new anhydrous magnesium chloride plant providing raw material for the production of 15,000 tons of magnesium. Construction continued at Sørford, Nordland, on a 200,000-ton-per-year magnesia plant based on local magnesite. Both plants are to be completed by 1977.

Nickel, Cobalt, and Platinum-Group Metals.—The Kristiansand refinery of the Falconbridge Nikkelverk continued to account for all Norwegian production of refined nickel, cobalt, and platinum-group metals as well as all refined copper. Production was based principally on nickel-copper matte imported from Canada and small amounts of sulfide concentrate produced as a byproduct of processing ilmenite ore at Tellnes, West Norway. The operating rate at the refinery at Kristiansand was reduced in August because of a strike at the Sudbury, Canada, operations and was maintained at about two-thirds normal capacity for the remainder of the year in response to lower demand.

Titanium.—Titania A/S, a subsidiary of N. L. Industries, Inc., U.S., accounted for over 99% of Norwegian production of ilmenite. Substantial additional capacity came onstream at the Hauge I Dalane ilmenite mines in the north of the country in 1974, allowing for an increased ilmenite output potential after 1975. Titanium-pigment production capacity at the Frederikstad pigment plant was in the process of being expanded from 20,000 tons to 25,000 tons per year. However, about four-fifths of the ilmenite concentrate produced in the country was exported.

NONMETALS

Cement.—In 1975, A/S Norcem, the only producer, operated three cement plants and employed about 3,000 persons. Two plants were located at Brevik and Slemmestad in the south of the country near large markets, and there was a small plant at Kjøpsvik in the north. Products included oil well cement, for which demand has been growing because of North Sea oil developments. Norway's cement exports went mainly to the United States and West Africa. Norcem built silos for 33,000 tons of cement in New York City, and has encouraged the building of special bulk carriers for transporting cement.

Other Nonmetallic Minerals.—A/S Olivin, Åheim, produced 150,000 tons of olivine, a magnesium iron silicate, at a West Coast location. Norddal Olivin A/S & Co. produced crushed olivine in Norddal, Sogn og Fjordane County. Norsk Nefelin, division of Elkem-Spigerverk mined nepheline syenite at Sternøy, on the Altafjord in Finnmark County, and operated an ore-dressing plant that produced 213,000 tons of glass and ceramic-grade material. Norfloat A/S, Lillesand, on the south shore, quarried 500,000 tons of pegmatite granite, obtaining 12,000 tons of flotation products, including alkali feldspar and quartz. A/S Norwegian Talc, Bergen, operated a grinding plant that produced 600,000 tons of dolomite, talc, mica, and other minerals. Elkem-Spigerverket A/S, Salten, produced 200,000 tons of quartzite in Gildeskal near Bodø. A/S Skaland Grafitwerk produced 9,375 tons of graphite flotation concentrate from an ore mined on Senja Island, Finnmark, in the north of the country.

Fertilizer Materials.—Norsk Hydro continued to account for the bulk of Norway's production and trade of fertilizer materials; its present ammonia capacity is 830,000 tons per year.

Gazocean Norsk A/S, Oslo, has awarded Norwegian shipbuilders an order for four 15,000-ton vessels. The ships are to transport phosphoric acid from the Republic of South Africa to Norway.

Pyrite and Sulfur.—Production of pyrite at principal mines in 1974 and 1975 is shown in the following tabulation, in tons:

Mine	1974	1975 p
Tverfjellet	260,311	294,783
Lokken	93,148	--
Skorovas	152,570	--
Sulitjelma	58,903	138,420
Fosdalens	24,238	--
Bleikvassli	19,300	24,352
Mofjellet	9,000	15,380
Killingdal	4,500	--
Total	621,970	472,935

p Preliminary.

The decrease in production was from cutbacks owing to further weakening of the pyrite export markets. Increased use was made of selective flotation for separating a copper concentrate from the bulk pyrite concentrate.

MINERAL FUELS

Norway has adequate supplies of hydroelectric power and has discovered large offshore oil deposits, which placed it among the oil-exporting countries in 1975. More than one-half of the country's energy requirement came from crude oil and oil products, four-tenths came from hydroelectric energy, and the rest from coal. The Norwegian Government controlled much of the country's oil industry, set the petroleum product prices, and was maintaining a go-slow policy on oil development. The Government has also controlled the Svalbard coal mining operations in recent years.

Higher oil prices and strict economy measures helped to lower the country's energy demand temporarily in 1974, but the level of consumption again reached previous highs in 1975. Norway's supply of energy and apparent consumption in 1973, 1974, and 1975 are shown in table 4. As will be seen, Norway was self-sufficient and a net exporter of energy for the first time in 1975.

Table 4.—Norway: Primary energy balance for 1973, 1974, and 1975
(Million tons of standard coal equivalent)[1]

Year	Total primary energy	Coal	Crude oil and petroleum products	Hydro-electric-power[2]
1973:				
Production	11.7	0.4	2.2	9.1
Imports	18.2	1.0	17.2	--
Exports	7.3	.1	6.5	.7
Apparent consumption	22.6	1.3	12.9	8.4
1974:				
Production	12.5	.4	2.5	9.6
Imports	17.2	1.3	15.9	--
Exports	8.8	.1	80.	.7
Apparent consumption	20.9	1.6	10.4	8.9
1975:				
Production	24.1	.4	14.0	9.7
Imports	14.5	1.3	13.2	--
Exports	16.2	--	15.5	.7
Apparent consumption	22.4	1.7	11.7	9.0

[1] 1 ton standard coal equivalent (SCE) =7,000,000 kilocalories.
[2] Exports and imports include total electric energy.

Source: Statistisk Månedschefte. Central Bureau of Statistics, Oslo, Norway, 1975, No. 12. Månedsstatistikk Over Utenriks-Handelen, Statistisk Sentralbura, Olso, Norway, 1976.

Coal and Coke.—The Norwegian Government took full control of the Store Norske Spitzbergen Kulkompani A/S. The company's Longyearbyen mine, Spitzbergen Island, is to reduce output to 400,000 tons per year of coal to stretch operations for another 20 years. A $90 million development continued at the Svea coalfield near Van Mijenfjorden, 33 miles south of Longyearbyen. Production is expected to start in 1978–79 with an initial capacity of 800,000 tons per year, to be increased later to 1.2 million tons or more. Seams up to 5 meters thick make efficient mechanization of the mining possible.

The Soviet Trust Artikugol mining company also operated two mines on Spitzbergen, one near the town of Barentsburg and the other at Pyramiden. Their total annual production of about 450,000 tons was shipped to the U.S.S.R.

Petroleum and Natural Gas.—*Exploration.*—Drilling activity was slow in the Norwegian sector of the North Sea at the beginning of the year with only three semisubmersible drilling rigs operating; by September, however, the number of rigs had increased to seven. In 1975, recoverable petroleum reserves were estimated at about 940 million tons of oil and 700 billion to 880 billion cubic meters of natural gas, but this is believed to be only a small part of probable reserves.

The official Norwegian estimate of total resources south of the 62d parallel was 3 billion to 4 billion tons of oil equivalent (oil and gas) in 1975. At the end of August, a total of 128 wells had been drilled in the area, but only about 3% of Norway's Continental Shelf had been allocated for drilling.[6]

North of the 62d parallel, the Norwegian Government has not yet permitted any drilling, but it is expected to start on a modest scale off the northern coast in 1977.

Exploration was concentrated mainly in the area between the 61st and 62d parallels, around Statfjord, the largest oilfield discovered in the North Sea. Statfjord, in which the Norwegian Government has exercised its 50% option through the national oil company, Statoil, contains recoverable reserves estimated at 400 million tons of oil and 123 billion cubic meters of natural gas.[7] No final decision has been made, but there are plans to transport the oil by pipeline to the west coast of Norway and the gas to West Germany.

Several other important structures are known to be located in the area, some of them in yet unallocated blocs nearer to the Norwegian coast.

Production.—The first oilfield to come into commercial operation in the Norwegian sector of the North Sea was the Ekofisk Field. Ekofisk is developed by the

[6] U.S. Embassy, Oslo, Norway. State Department Airgram A-176, Sept. 26, 1975, pp. 5–6.
[7] Work cited in footnote 6.

Phillips Norway Group, with Phillips Petroeum Co. Norway as the operator. It consists of Phillips Petroleum Co. Norway (39.96%), Norske Fina A/S (30%), Norsk Agip A/S (13.04%), Norsk Hydro (6.7%), Elf Norge A/S (5.396%), Total Marine Norge, A/S (4.047%), Aquitaine Norge A/S (2.698%), Eurafrep Norge A/S (0.456%), Coparex Norge A/S (0.399%), and Cofranord A/S (0.304%). Crude oil production built up throughout the year in the Norwegian sector of the North Sea. The initial 30-well Ekofisk Field development drilling program was nearing completion. Development drilling began in West Ekofisk, one of the six fields in the area to be linked by pipeline to the Ekofisk production complex. In mid-October the 350-kilometer crude oil pipeline to the Teeside terminal in England started transporting oil, eliminating interruptions in the production process caused by winter storms. The production rate exceeded 16 million tons per year from 23 wells until November 1, when a fire temporarily suspended operations at one of three platforms. The platform was expected to be back in operation in March 1976. For 1975 as a whole, Ekofisk production totaled 9.5 millions tons [8] from an average of 16 wells.

Construction of the 440-kilometer natural gas pipeline from the Ekofisk complex to Emden, West Germany, and a natural gas distribution center there were completed. Operation will start in 1977 with completion of related facilities at the Ekofisk complex and the Teeside terminal.

A new contract was signed for sale of Norwegian North Sea gas to the European gas distribution consortium; four Ekofisk area fields are involved. Deliveries are to begin in 1978 and are to reach, under the present and an earlier contract, 22 billion cubic meters per year.

The development of the Frigg Field, one of the world's largest offshore natural gas deposits, estimated to contain total reserves of about 300 billion cubic meters of gas in its main gasfield, has experienced some setbacks from technical difficulties and delays in platform deliveries.[9] The gas is to be transported by two pipelines to St. Fergus, Scotland, starting in 1977. The Petronord group, which controls the Norwegian part of this Norwegian-British gasfield, has committed itself to build and operate a 3-billion-cubic-meter-per-year pipeline to Karmøy in West Norway, but Norwegian authorities have not yet concurred in the scheme.

The Norwegian Government is deliberately moderating the exploitation of Norway's offshore petroleum resources to extend the lifetime of the petroleum resources. The state petroleum directorate predicts yearly production of 90 million tons in the early 1980s and, if no new reserves are found, production will fall off gradually thereafter.

Trade, Refining, and Consumption.— Increasing production from the Ekofisk oilfield resulted in increased exports of crude oil and petroleum products, and the country became a net exporter in spite of substantial crude oil and product imports.

Production started officially at the $230 million, 4-million-ton-per-year Mongstad refinery in Karmøy, West Norway, which will bring the country's refining capacity to about 12.6 million tons per year. Other refineries included A/S Norske Esso's 5.5-million-ton-per-year Slagen, the 200,000-ton-per-year Valloy refineries, and A/S Norske Shell's 2.75-million-ton-per-year Sola and 150,000-ton-per-year Valloy refineries.

Norwegian oil policy is aimed at increased state control in all phases of the petroleum industry. The Government negotiated a contract for the takeover of Norsk Braendselolje A/S, British Petroleum's Norwegian subsidiary. The $180 million deal includes a countrywide system of 1,300 gas stations and a 40% interest in the Mongstad refinery. The remaining 60% in the refinery's stock is owned by Norsk Hydro, in which the Norwegian Government has majority interest. The Government was also negotiating a takeover of A/S Norske Oljekonsum, a smaller petroleum distribution system owned by Norwegian and Swedish consumers' cooperatives.

Inland consumption of refinery products in 1974 was as follows, in thousand tons:

	1974
Aviation fuels	254
Gasoline	1,049
Kerosine	294
Gas and diesel oil	2,569
Residual fuel oil	1,869
Other	1,034
Total	7,069

Source: Organization for Economic Cooperation and Development (Paris). Provisional Oil Statistics by Quarters, 4th Quarter 1975. P. 9.

[8] Phillips Petroleum Co. 1975 Annual Report. P. 8.

[9] Work cited in footnote 6.

The Mineral Industry of Pakistan

By David G. Willard [1]

The future looked better than the present for Pakistan's mining industry in 1975. Production and exports of mineral commodities remained almost stationary, while the cost of mineral imports increased by over 80%, plunging the country's balance of trade deep into deficit. Little improvement in the picture is expected in the next year or two, but long-term plans were being made to increase the utilization of domestic resources and reduce costly dependence on foreign supplies.

Marketed production of natural gas, Pakistan's most valuable mineral commodity, dropped slightly, and the output of crushed stone fell sharply. Production of cement, the country's only important mineral export, decreased and that of chromite, its principal metal ore, increased. Crude petroleum output declined and supplied less than 10% of domestic requirements, whereas the oil import bill, inflated by climbing world prices, was more than double that of 1974. A wide variety of other mineral production took place but remained minor in quantity and value.

Under the impact of higher petroleum costs, the country's balance of mineral trade fell steeply into the red. The value of mineral exports, chiefly cement, gained 15%, while expenditures for petroleum, metals, fertilizers, and other mineral imports soared 83% above the 1974 level, swelling the deficit in mineral trade by 91%. Mineral export earnings covered 6% of mineral import expenses in 1975, down from 10% in 1974.

Government plans to improve the mineral economy involved a multitude of activities. An increased rate of crude oil production and further development of the natural gas and fertilizer industries were scheduled in an attempt to gain relief from the escalating costs of imported petroleum and fertilizers. Construction of new cement plants and modernization of marble quarries and salt mines were planned in the hope of augmenting foreign-exchange earnings. In the longer term, several major projects including the country's first steel mill, development of a copper mine, and increased utilization of domestic uranium for nuclear power were designed to accelerate development of the country's mineral potential and bolster its sagging foreign trade position.

Other long-range government programs included developing the mineral potential of economically depressed Baluchistān Province and continuing the geological and mineral surveys in the country. Among the numerous mineral prospects being investigated in Baluchistān were copper, iron, magnesite, fluorspar, and sulfur. Major projects or proposals included a copper mine at Saindak, a ferrochrome plant, two cement plants, and a ministeel mill. Other mineral survey programs were concentrating on the relatively unexplored northern mountain districts of Azad Kashmin, Chitrāl, Gilgit, and Swāt in efforts to evaluate and develop their resources of gold and other metals, graphite, and gem stones.

No changes were made in the organization of government mineral-related activities. Two agencies formed in 1974, the Pakistan Mineral Development Corp. (PMDC) and the Resource Development Corp. (RDC), defined their objectives and initiated operations. RDC was concerned exclusively with the Saindak copper development and PMDC covered all mineral fields except Saindak copper, nuclear materials, and oil and gas. Specialized agencies in charge of energy materials were the

[1] Economist, Division of Nonmetallic Minerals.

Pakistan Atomic Energy Commission (PAEC) and the Oil and Gas Development Corp. (OGDC), the latter operating under the Ministry of Fuel, Power, and Natural Resources. In addition, the Geological Survey of Pakistan conducted geologic studies and nonpetroleum mineral exploration. Three provincial governmental bodies, the Baluchistān Devolpment Authority (BDA), the Punjab Mineral Development Corp., and the Sarhad Development Board (of the Northwest Frontier Province), performed similar nonpetroleum exploration and development functions within their regions, often through outside contractors.

Domestic private industry's role in the mining sector continued to be limited by both government policy and investor caution. New investment in heavy industry, aside from petroleum exploration and refining, was limited almost exclusively to the public sector. Government policy was to maintain control of those industries considered essential to the economy, except where foreign technology and/or capital were required, leaving most areas of medium and small industry to private enterprise. No further nationalizations had occurred since early 1974, but growth of private investment remained slow and was concentrated in such nonsensitive areas as farm improvement, transportation, residential construction, and small industry. Foreign private investment continued to be welcome as long as it could provide advanced technology, large capital inputs, or new export markets.[2]

PRODUCTION

Pakistan's mineral output exhibited minor changes in 1975, but the overall results remained similar to those of 1974. Production of natural gas from the Sui and Mari Fields was slightly lower, and crude petroleum output decreased in 1975 after a small gain in 1974. Recorded coal production decreased, as did production of marine salt. Dimension stone increased, as crushed stone output fell drastically, probably reflecting completion of the major portion of Tarbela Dam.

In addition to these major commodities, Pakistan produced relatively small amounts of a wide variety of minerals. The major metal ore was chromite, output of which was up 4%. Among the numerous nonmetals, those of some importance included barite, refractory clays, china clay, other clays, magnesite, rock salt, sand and gravel, soapstone, and sulfur. Production of some of these may be increased substantially in the future if development programs being carried out, mostly by the Government, prove successful.

Processed mineral commodities are of considerable importance to the economy. Although cement is the country's only significant mineral industry export, domestic production of chemical fertilizers and petroleum refinery products reduced the need for costly mineral imports.

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[2] U.S. Embassy, Islamabad, Pakistan. State Department Airgrams A-41, Mar. 26, 1976, and A-72, May 17, 1976.

Table 1.—Pakistan: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Aluminum, bauxite, gross weight	r 157	274	--
Antimony ore:			
Gross weight	41	184	120
Metal content e	8	37	24
Chromium, chromite, gross weight	r 17,045	9,537	9,961
Iron and steel, mild steel products [1] thousand tons	210	212	231
Manganese ore, gross weight	61	7	93
NONMETALS			
Abrasives, natural, emery stone	438	387	710
Barite	2,129	5,157	4,598
Cement, hydraulic thousand tons	2,905	3,503	3,120
Chalk	537	1,189	712
Clays:			
Bentonite	970	545	676
Fire clay	48,079	15,974	26,238
Fuller's earth	12,195	14,602	12,141
Kaolin (china clay)	602	1,109	366
Other	109,520	69,315	71,732
Feldspar	1,211	4,767	2,671
Fertilizer materials, manufactured:			
Nitrogenous: [2]			
Gross weight	r 667,807	681,576	783,150
Nitrogen content	r 292,163	289,845	333,326
Phosphatic, gross weight	38,147	21,171	42,330
Fluorspar	847	69	--
Gypsum, crude	178,155	273,183	569,245
Magnesite, crude	3,423	2,915	2,015
Natron, manufactured (soda ash)	77,488	80,805	79,215
Pigments, natural mineral, ocher	6,183	15,236	1,713
Salt:			
Rock thousand tons	378	386	409
Marine do	104	134	131
Total do	482	520	540
Sand and gravel:			
Gravel	50,722	89,971	54,150
Sand:			
Bajri [3] } Common [4] }	19,909	38,897	58,796
Glass [5]	r 35,471	39,051	32,003
Stone:			
Aragonite and marble	18,865	23,597	33,219
Dolomite	156	639	483
Limestone thousand tons	2,723	2,968	3,710
Crushed [4] do	621	2,446	172
Strontium minerals, celestite	3	379	1,033
Sulfur [6]	2,798	2,128	1,227
Talc and related materials, soapstone	5,962	6,709	3,220
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades thousand tons	r 1,161	1,500	1,000
Gas, natural, sales million cubic feet	155,383	175,000	164,101
Natural gas liquids e thousand 42-gallon barrels	70	30	33
Petroleum:			
Crude oil do	2,871	2,923	2,190
Refinery products:			
Gasoline do	2,567	2,177	e 2,000
Jet fuel do	2,995	3,317	e 3,100
Kerosine do	2,642	2,256	e 2,100
Distillate fuel oil do	5,923	5,855	e 5,500
Residual fuel oil do	8,106	8,813	e 8,300
Lubricants do	569	611	e 600
Other do	1,129	1,374	e 1,300
Refinery fuel and losses do	923	951	e 900
Total do	24,854	25,354	e 23,800

e Estimate. p Preliminary. r Revised.

[1] As reported in source, types of products not specified.

[2] Data are for urea and ammonium sulfate for all years, and figures for last half of 1974 and all of 1975 also include ammonium nitrate; total output listed for each year distributed as follows in metric tons: 1973: urea—592,865 and ammonium sulfate—74,942; 1974: urea—554,662; ammonium sulfate—94,544; and ammonium nitrate—32,370 (last half of year only); 1975: urea—626,496; ammonium sulfate—97,463; and ammonium nitrate—59,191.

[3] As reported by North-West Frontier Province only; no details on the nature of this sand are available.

[4] Punjab and Sind Provinces only; additional quantities may be produced in other provinces.

[5] Punjab, Sind, and North-West Provinces only; additional quantities may be produced in other provinces.

[6] Produced in Baluchistān Province only; type of sulfur not reported.

TRADE

Recession in Pakistan's export markets and sharp increases in the prices of many of its major imports caused a drastic deterioration in the country's balance of trade in the 1974–75 fiscal year. Value of exports increased only 4% to $1,057 million, but value of imports increased 54% to $2,088 million, causing a tripling of the trade deficit from $333 million in 1973–74 to $1,031 million in 1974–75. Mineral trade constituted an important part of the deficit, for while mineral exports gained 15% to $45 million, imports of mineral commodities increased 83% to $728 million, raising the mineral trade deficit 91% to $683 million. Principal mineral imports were iron and steel, crude petroleum, petroleum refinery products, and manufactured fertilizers. Iron and steel, crude petroleum and petroleum refinery products accounted for most of the increase in value of imports. Higher prices, particularly for petroleum, were responsible for a large share of that growth. Cement continued to be the most important mineral product exported, and was the only export that showed a significant gain in value; the gain was partly offset by declines in petroleum refinery products and nonmetallic building materials.

Balances of mineral and nonmineral trade for the last 3 fiscal years are shown in the following tabulation, in million dollars:

	1972–73	1973–74	1974–75
Exports and reexports:			
Mineral	30	41	47
Nonmineral	934	980	1,010
Total	964	1,021	1,057
Imports:			
Mineral	247	397	728
Nonmineral	692	957	1,360
Total	939	1,354	2,088
Balance of trade:			
Mineral	−217	−356	−681
Nonmineral	242	23	−350
Total	25	−333	−1,031

Aside from raising import taxes on 25 classes of luxury goods, Pakistan has imposed no additional restrictions on trade despite its balance of payments difficulty. Increased foreign aid, especially from the Organization of Petroleum Exporting Countries (OPEC), covered most of the trade deficit, and should continue to do so in 1975–76. Improvement in mineral trade seemed unlikely in 1975–76 since there were no major new mineral export possibilities and the country continued to be dependent on foreign sources of petroleum, petroleum-related products such as fertilizers, and metals. However, improved world economic conditions and agricultural recovery from the 1974 drought were expected to reduce the overall trade deficit slightly. Within the next few years, increased domestic fertilizer-production capacity and greater cement exports may narrow the mineral trade gap.

The following tabulations list the value of Pakistan's mineral exports and imports by major class.

Commodity or commodity group	Value of exports and reexports (million dollars)	
	1973–74	1974–75
Chromite	(1)	1.0
Other metallic ores	(1)	(1)
Metals including scrap	r 1.7	.5
Cement	r 16.1	28.2
Gem stones including diamond	.7	.6
Salt	.1	.2
Stone, sand and gravel	.3	.2
Petroleum and petroleum refinery products	r 17.7	14.0
Other	r 5.4	2.9
Total	r 42.0	47.6

r Revised.
1 Less than $50,000.

Commodity or commodity group	Value of imports (million dollars)	
	1973–74	1974–75
Iron and steel including ores and scrap	r $106.7	$220.8
Other metals including ores and scrap	r 34.7	47.9
Fertilizer materials	r 91.2	104.4
Coal and coke	5.2	8.3
Crude and partly refined petroleum	r 106.6	218.8
Petroleum refinery products	r 45.9	117.9
Other	r 8.5	12.0
Total	r 398.8	730.1

r Revised.

COMMODITY REVIEW

METALS

Bauxite.—A 3-year exploration program for the bauxite deposits in the Khushab and Kāla Chitta areas and aluminous clays near Campbellpur has been prepared by the PMDC. One possible use for these bauxite and aluminous ores may be in refractories for the Karāchi steel mill.[3] Iran has agreed to purchase alumina from Pakistan under the Regional Cooperation Development Program.[4]

Chromite.—Production increased 4% to 9,961 tons in 1975 from 9,537 tons in 1974 but remained well below the 25,000-ton annual level of the late 1960's. Most of the production was exported. Transportation costs, labor problems, and the high iron content of the ore have made it increasingly difficult for domestic mines to compete in world markets and have been responsible for the long-term decline in output.

Because of the high and varying iron content (iron-to-chromium ratio of between 1:2.5 and 1:3.6), a study of the feasibility of setting up a ferrochrome plant was underway. The plant, to be built with West German assistance, would be located at either Muslimbagh or Quetta. Cost of the 15,000-ton-per-year plant was estimated at about $7 million. The scheduled completion date of 1977 for the plant may prove overly optimistic.[5]

Copper.—The Geological Survey of Pakistan expected to complete core drilling of the Saindak copper deposit in the Chagai Hills of Baluchistān by mid- to late 1976. RDC was seeking assistance from the United Nations and international mining companies in preparing a feasibility study. Some U.S. firms had expressed interest in the project, but none had yet indicated an intention to participate. Remote location and inadequate transportation and water supplies continued to be the principal problems inhibiting exploitation of the resource.[6]

Iron and Steel.—Construction of the country's first integrated steel mill, which was being built with Soviet aid, was in progress at Pipri, east of Karāchi. The 1.1-million-ton-capacity plant will utilize Australian iron ore because domestic deposits, though large, are too low in grade. Construction of the first blast furnace began. Engineering services were being provided by Société Française Siderurgie (SOFRASID). Operation of the first blast furnace was expected in 1978, with full capacity to be attained by 1980.[7]

An aeromagnetic survey has indicated that there may be 5 million tons of iron ore in Baluchistān Province. PMDC was conducting ground surveys in an attempt to prove out a reserve of at least that amount in the Pachi Koh area to make feasible a ministeel mill there. Plans called for the mill, which actually would be a pig iron plant, to use a direct-reduction method in order to take advantage of readily available natural gas. Technical and financial assistance for the project was being provided by the People's Republic of China.[8]

Uranium.—Pakistan's Atomic Energy Commission proposed ambitious plans for nuclear power development based on the uranium resources in the Dera Ghazi Khan area of Punjab Province. Construction of eight nuclear powerplants was scheduled during the 1980's, beginning with the 600-megawatt unit at Chashma Barrage, which was to come onstream in 1982. In addition, a plutonium separation plant was to be built with French assistance to reprocess spent nuclear fuel, along with a technical training center at Karāchi. The commission based its proposal on the country's inadequate petroleum and coal resources and its desire to reserve natural gas for domestic heating and raw material uses. However, the availability of foreign sources of financing required for these projects remained uncertain.[9]

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[3] Pakistan Economist. The Week. No. 17, Apr. 24, 1976, p. 33.
U.S. Embassy, Islamabad, Pakistan. State Department Airgram A-72, May 17, 1976, p. 11.
[4] U.S. Embassy, Islamabad, Pakistan. State Department Airgram A-70, May 2, 1975, pp. 7-8.
[5] Mining Journal. Pakistan: Progress but Problems. V. 284, No. 7291, May 16, 1975, p. 371.
U.S. Embassy, Islamabad, Pakistan. State Department Airgrams A-70, May 2, 1975, p. 3, and A-72, May 17, 1976, p. 3.
[6] U.S. Embassy, Islamabad, Pakistan. State Department Telegram 11370, December 1975.
Page 6 of work cited in footnote 4.
[7] Page 7 of work cited in footnote 4.
Pakistan Economist. This Week. No. 19, May 8, 1976, p. 32.
U.S. Consulate, Karāchi, Pakistan. State Department Telegram 506, March 1975, p. 1.
First work cited in footnote 5.
[8] Pakistan Economist. Baluchistān. No. 9, Feb. 28, 1976, p. 10.
[9] U.S. Embassy, Islamabad, Pakistan. State Department Airgram A-55, Apr. 16, 1976, p. 1.

Other Metals.—Austromineral, a subsidiary of VOEST-Alpine AG of Austria under contract to PMDC, was investigating the feasibility of large-scale placer mining for gold in the Indus River Valley of Gilgit District in the Northwest Frontier Province. The mineral potential of this mountainous region has been little explored owing to its remote location and lack of infrastructure. Activities planned during 1975 included geologic mapping, trenching, drilling, and analysis of gold-bearing samples. If a deposit of at least 25 million tons containing 0.3 grams of gold per ton could be proven, PMDC planned to establish a 5,000-ton-per-day operation.

Under a contract with the Sarhad Development Authority of the Northwest Frontier Province, Austromineral was also examining deposits of antimony, gold, iron ore, molybdenum, and tungsten in the Chitral District, another high mountain area whose mineral potential was largely unknown and undeveloped.

Deposits of manganese were located in the course of exploration for iron ore in the Las Bela–Khuzdar region of Baluchistān Province. Canada's International Development Agency planned to carry out an aeromagnetic survey of the area in order to determine its full mineral potential.[10]

NONMETALS

Barite.—Production declined to 4,600 tons in 1975 after an increase to nearly 5,200 tons in 1974, thus reverting to the previous downward trend. Production from small mines in the Northwest Frontier Province has been declining for several years despite the upturn in petroleum exploration activity. Plans for reversing this trend rest on development of the deposit near Khuzdar in Baluchistān, which was estimated to contain at least 1.3 million tons of ore. The barite-crushing plant at Khuzdar, a joint project of Pakistan Petroleum Ltd. (PPL), and the Government of Baluchistān, was expected to begin operation in the early part of 1976. Cost of the plant will be about $800,000. Its initial capacity will be 25,000 tons per year, with planned expansion to 70,000 tons per year in 5 years. Most of the production will be exported.[11]

Cement.—Output totaled 3.1 million tons in 1975, slightly lower than the 3.5 million tons produced in 1974. Earlier plans had called for doubling the country's cement production by 1977 by expanding four of the nine existing plants to add a total of 1.2 million tons annual capacity, and constructing three new plants with an aggregate capacity of 2.5 million tons per year. Total cost of the new plants was estimated at $120 million, and an additional $50 million would be required for the expansions. Recent economic and balance-of-payments difficulties may have forced some delay in implementing these plans. They will probably be completed in the near future, however, because the cement serves both domestic needs and is the country's principal mineral source of foreign exchange.

Fertilizer Materials.—Domestic chemical fertilizer production satisfied about 70% of Pakistan's fertilizer requirements; the remainder had to be imported at rapidly rising costs, which exceeded $100 million in the 1974–75 fiscal year. In order to eliminate this large foreign-exchange drain, the Government planned to build four additional fertilizer plants by 1979: The Pak-Arab plant at Multan, the Hazāra complex at Haripur (near Abbottābād), the Pak-Saudi plant at Mirpur Mathelo (near Sukkur), and the Fauji Foundation plant at Machi Goth (near Bahawalpur).

The Hazara project involved mining a phosphate deposit located near Abbottābād in the Northwest Frontier Province. Powell-Duffryn Co. of the United Kingdom was carrying out a survey of the deposit and preparing a feasibility report on the project. The area had previously been estimated to contain 2.5 million tons of phosphate ore in three deposits. One of the deposits reportedly contained approximately 700,000 tons of marketable rock, averaging 32% P_2O_5. To test the ore, 20 tons per day was being mined and processed at the Lyallpur-Jaranwala plant, with plans to increase the rate to 120 tons per day by July 1976. In April 1975, the Government placed orders with Simon Carves, Ltd., of the United Kingdom for the ammonium phosphate and urea plants. The $247 million project, which would also include an ammonia plant, was expected to produce 700,000 tons per year (approximately 2,100 tons per day)

[10] World Mining. Pakistan. V. 28, No. 8. July 1975, p. 70.
Work cited in footnote 5.
[11] Work cited in footnote 3.
Page 3 of work cited in footnote 4.

of superphosphate, diammonium phosphate, and phosphoric acid on its completion in late 1978 or early 1979.

The Pak-Arab plant, a joint project of the Pakistan Government and the Abu Dhabi National Oil Co., was expected to be the first of the four plants to come onstream, in 1977 or 1978. It was to produce 1,200 tons per day of ammonium nitrate and 1,500 tons per day of calcium ammonium nitrate.

The Mirpur Mathelo project was to consist of a 1,000-ton-per-day ammonia plant and a 1,740-ton-per-day urea plant. Its natural gas supply would come from the nearby Mari Field. The estimated $196 million cost would be financed by a $50 million loan from the Government of Saudi Arabia a $30 million loan from the Saudi Fund for Development, a $50 million loan from the Asian Development Bank, and the remainder from the Government. Operation was scheduled to begin in early 1978.[12]

Salt.—Rock salt output remained at approximately 400,000 tons, where it has been for the last several years. Although Pakistan has large reserves of rock salt in the Salt Range of Punjab Province and an export market, obsolete equipment at the mines and transportation costs have kept a ceiling on production. Marine salt output decreased to 131,000 tons, 2% less than the 134,000 tons produced in 1974.

Modernization of the three major rock salt mines was planned by PMDC. Machinery dating from the 1930's was to be replaced and modern extraction methods adopted. A 50% increase in production was anticipated.[13]

Stone.—Production of marble and other types of dimension stone were up substantially to 33,219 tons in 1975 from 23,597 tons in 1974, but exports of marble declined sharply in value from $286,000 in 1974 to $47,000 in 1975. Recession in the construction industry in Italy was believed to have caused most of the drop. Good-quality travertine marble has been one of the country's more important mineral exports, and ample deposits are available. An opportunity was believed to exist for increased exports to Pakistan's oil-producing neighbors.[14]

Other Nonmetals.—Two projects designed to boost Pakistan's production of refractory materials were undertaken by the Pakistan Industrial Development Corp. (PIDC). A plant was opened in Karāchi that will make 6,000 tons per year of fire clay brick and 4,000 tons per year of high-alumina brick. Fire clay is mined locally, but the alumina must be imported because the country has as yet no alumina production and only a small output of bauxite. General Refractories Ltd., will operate the plant.

A deposit of magnesite at Kumber, near Abbottābād, was being investigated by PIDC with the People's Republic of China's assistance. A reserve of 1.5 million tons has been proven, and total resources may be considerably more. Analysis of the ore has shown it to be suitable for the manufacture of refractories, and a plant producing 15,000 tons per year of magnesite and magnesite-chrome bricks has been proposed. Present plans call for construction to begin in 1977 or 1978, with the plant coming onstream in 1980.[15]

A proposal to use the kaolin produced in the Swāt District to make fine china was under discussion. The material presently goes into the manufacture of tiles and sanitary fixtures.

Included among the Government's plans to improve the economy of Baluchistān were projects to investigate the sulfur and fluorite resources of that province under the joint direction of PMDC and BDA. A small production of sulfur was taking place at Koh-i-Sultan in the Chagai Hills, where an estimated 644,000 tons of ore containing 50% to 65% sulfur are located. There are other surface signs of sulfur in the area, and PMDC and BDA together with private interests formed the Baluchistān Sulphur Enterprise to develop the deposits and establish a 3,000-ton-per-year refining plant near Quetta. The project was expected to take several years.

Fluorite deposits in the province were being examined with an eye to their pos-

[12] Progress. Gas Consumption by Fertilizer Industry. V. 20, No. 9, April 1976, p. 1.
Work cited in footnote 5.
Asian Development Bank. ADB Lends $50-M to Pakistan for Mirpur Mathelo Fertilizer Project. ADB News Release No. 71/75, Dec. 18, 1975.
Chemical Engineering. Pakistan. V. 82, No. 9, Apr. 28, 1975, p. 143.
[13] Lefond, S. J. Salt. Min. Eng., v. 28, No. 3, March 1976, p. 46.
[14] Page 4 of work cited in footnote 4.
[15] Industrial Minerals. Pakistan, Refractory Advances. No. 95, August 1975, p. 11.
U.S. Embassy, Islamabad, Pakistan. State Department Airgram A-72, May 17, 1976, pp. 4-5, 9.

sible use in the steel mill to be built at Karāchi.

An official gem stone buying agency came into being following the disclosure that emeralds worth many millions of dollars had been smuggled out of the country over the last several years. Police raids recovered a large cache of the precious stone and appeared to implicate a number of local officials in the district of Swāt where the mines are located. In an attempt to forestall further smuggling, the Government setup an organization to buy, process, and export the gem stones. In addition, a training institute in gem cutting and polishing and a gem cutting center, both in Peshawar, were planned. These facilities were to be part of a Lapidary Pilot Project approved by the Government in 1974.[16]

Studies were also being conducted of the graphite resources located in Azad Kashmir Province, which are estimated at more than 50,000 tons and would be sufficient to supply the country's needs for many years. An investigation of the deposits was scheduled for the summer of 1975. Upgrading the existing processing plant was planned, but no date was given.

A number of other mineral deposits in various parts of Pakistan were being examined by PMDC and the three provincial mining agencies. Included were bentonite near Kohat, fuller's earth and gypsum near Dera Ghazi Khan, graphite and kaolin in Dir District, corundum near Abbottābād, potash in the Salt Range and in brine deposits near Jhelum, dolomite near Mianwali and at other locations (for possible fluxing use in the Karāchi steel mill), and marble in Buner District.[17]

MINERAL FUELS

Although Pakistan fared better than many countries during the world energy crisis of 1974–75, assuring a sufficient future supply of energy continued to be a major Government concern. Common religious ties with the oil-producing nations secured the country's petroleum supply in 1975, but the oil import bill was assuming serious proportions. Imports of crude oil and petroleum refinery products cost $337 million in the 1974–75 fiscal year, 120% more than in 1973–74, and accounted for 16% of total 1974–75 import expenditures. Domestic petroleum production met less than 10% of the country's requirements. Other domestic conventional energy sources, principally natural gas and undeveloped hydroelectric power, were not large or, in the case of coal, were of low quality. Barring major petroleum discoveries, the Government planned to depend more heavily on nuclear power based on domestic uranium resources, possibly supplemented by unconventional sources such as bio-gas converters and solar energy.

Coal.—Reported production of coal decreased to 1.0 million tons in 1975 from 1.5 million tons in 1974. Total coal production was not known because a sizable proportion, mined by brick producers for their own use, was unreported. An additional $8.3 million of coal and coke were imported, a 60% increase in cost from the $5.2 million purchased in 1974. Brick kilns consumed 95% of domestic coal production, powerplants consumed 4%, and 1% went to domestic uses.

Rising petroleum prices and a desire to reserve natural gas for raw materials purposes has caused greater attention to be focused on the country's extensive but low-grade coal resources. Two major coal-utilization projects were in the planning stage: The Lakhra coal-fired powerplant and the Sharigh coal-washing project.

At the Lakhra coalfield in the Indus River Valley north of Hyderabad, PMDC was establishing the reserves, which had been estimated at 250 million tons. Tentative plans called for production of 4,000 tons per day, the entire output to be consumed in a 240-megawatt powerplant. Development work was scheduled to begin in early 1977. No date was given for completion of the project.

The Sharigh coal-washing project is intended to provide part of the fuel supply for the Karāchi steel mill, reducing the need for imported coal. Production from the low-grade Sharigh Field, east of Quetta in Baluchistān Province, will be upgraded by washing, transported to Karāchi, and blended with high-quality imported coal for use in the mill. Funding for the project will come partly from a Canadian International Development Agency loan.

[16] Pakistan Economist. Northwest Frontier Province (N.W.F.P.) No. 5, Jan. 31, 1976, p. 10.
Mining Journal. Smuggling in Swāt. V. 286, No. 7333, Mar. 5, 1976, p. 183.
Page 5 of work cited in footnote 4.

[17] Industrial Minerals. Pakistan, Joint Venture Exploits Baluchistān Minerals. No. 100, January 1976, p. 9.
Work cited in footnote 5.

The Government also planned to install modern equipment at the Makerwal mine in Punjab Province, the country's largest, and at three smaller mines in Baluchistān in order to reach proven coal reserves below those currently being exploited.

In addition to these projects, the Government planned to establish a Fuel Research Laboratory that would investigate ways to utilize domestic coal resources.[18]

Natural Gas.—Sales from the Sui and Mari Fields totaled 149.6 billion cubic feet in 1975, down slightly from the 1974 figure of 152.0 billion cubic feet. Minor production may also have taken place at the Potwar plateau oilfields and at several small gasfields in Sind Province. There were no imports of natural gas, but a small amount of liquefied natural gas was exported. Gas from Sui served a large number of customers in northern Pakistan and in the Karāchi area. Mari gas was consumed entirely in the Esso Pakistan Fertilizer Co. Ltd., plant near Sukkur.

Revised figures reduced the country's total estimated reserve to 14.33 trillion cubic feet from the 17.43 trillion cubic feet reported earlier. Reserves in the Sui Field were estimated at 7.9 trillion cubic feet and those in the Mari Field at 4.1 trillion cubic feet, with the oilfields and minor gasfields accounting for the remainder.

An agreement was reached in principle between the Government and Esso that would open the way to further development of the Mari Field. The Government would purchase Esso's oil product-distribution system and its interest in a refinery, and Esso would use the money from that sale to develop Mari. Details and timing of the scheme remained to be worked out.

Construction was in progress on the second pipeline from the Sui Field to Karāchi, scheduled for completion by the end of 1976. It would relieve a shortage of industrial gas in the Karāchi area.

Another gas pipeline expansion was underway in northern Pakistan where Sui Northern Gas Pipelines, Ltd., was preparing to build 65 miles of new pipeline and 116 miles of looping. The expansion would provide gas supplies from Sui to four new cities. Financing for the project was to be provided by the World Bank.[19]

Petroleum.—Domestic crude oil output from the Potwar plateau fields declined sharply in 1975 to 2.2 million barrels (300,000 tons) from 2.9 million barrels (400,000 tons) in 1974. More than 90% of the country's petroleum requirements had to be imported at a cost that reached $337 million in the 1974–75 fiscal year, including $118 million of refinery products. Saudi Arabia and the United Arab Emirates were the main sources of supply. Pakistan's three refineries produced 23.8 million barrels of refinery products, a decrease of 6% from the 1974 output of 25.4 million barrels.

The Government planned to reduce the drain on foreign exchange by raising the rate of production from the existing oilfields to a level sufficient to meet 15% to 20% of the country's annual petroleum needs. The higher production rate would require an increase in the ratio of gas to oil and would result in a more rapid depletion of the underground gas pressure that moved the crude oil into the wells. As a result, the increased output rate would hasten the time when secondary recovery methods would be needed if the fields were to remain in production.

Six oil companies and OGDC were actively exploring for petroleum during the year, but the finds were modest. Pakistan Oilfields, Ltd. (POL), discovered one oil producer in the Meyal Field, bringing the total number of successes in that field to three and adding between 500 and 2,000 barrels per day to the nation's production. OGDC brought in three gas producers in various locations. A total of seven exploration wells were begun during the year, five onshore and two offshore. Both offshore wells came up dry: One by Marathon Oil Co. and one by Wintershall A.G., and both companies deferred further drilling in favor of additional studies. American Oil Co. (AMOCO) had one dry hole in its old concession area and began to conduct seismic surveys in its new concession south of the Kandkhot gasfield. POL and OGDC each had wells in progress at yearend. The year's

[18] U.S. Consulate, Karāchi, Pakistan. State Department Airgram A-56, June 20, 1975, p. 1.
Mining Magazine. Coal Expansion for Pakistan. V. 133, No. 1, July 1975, p. 49.
U.S. Embassy, Islamabad, Pakistan. State Department Airgrams A-70, May 2, 1975, p. 3, and A-72, May 17, 1976, p. 3.
[19] Progress. Sui Reserves. V. 20, No. 7, February 1976, p. 1.
Ewing, R. C. Pakistan in Midst of Long-Range Gas-Pipeline-Expansion Program. Oil and Gas J., v. 73, No. 48, Dec. 1, 1975, pp. 119–122.
U.S. Embassy, Islamabad, Pakistan. State Department Airgram A-72, May 17, 1976, pp. 2–3.

unsuccessful efforts were expected to bring a reduction of exploration activity in 1976.[20]

Construction work continued on the Pak-Arab refinery at Multan. Contract bidding was to begin for the pipelines, pumping stations, and terminals serving the refinery. Construction programs were also underway at two of the country's existing refineries. Additional crude naphtha hydrotreating capacity and new units for catalytic reforming and distillate hydrodesulfurization were being installed at the National Refinery Ltd. in a project expected to be completed in early to mid-1976. Total capacity would be raised to 43,760 barrels per day from 31,190 barrels per day. At the Pakistan Refinery Ltd., new visbreaking and distillate hydrodesulfurization units were being added, with the expected completion date in 1977. Total refinery capacity would be unchanged. Another set of projects involved the construction of a specialty asphalt plant, a specialty oils plant, and a wax-refining plant, all of which would be located adjacent to the National Refinery and would take their feedstocks from it. Work on the specialty asphalt plant began in early 1975, and all three plants were expected to be finished within the next 2 years. Their production would replace imported supplies.[21]

Other Energy Sources.—In related energy developments, the Government planned to setup a series of nontraditional energy sources in rural areas on an experimental basis. A total of 100 small bio-gas plants had been installed in various locations, and 10,000 more were programed for installation during the next 5 years. The University of Peshawar had been distributing solar stoves and planned to have 25,000 in operation within 5 years. Another Government program involved the installation of solar water pumps for irrigation use in remote areas. These programs might reduce the need for expensive petroleum imports and make energy sources available to sparsely populated regions of the country.[22]

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[20] Progress. Oil Search in Pakistan. Monthly.
U.S. Embassy, Islamabad, Pakistan. State Department Airgram A-72, May 17, 1976, p. 5.

[21] U.S. Consulate, Karāchi, Pakistan. State Department Telegram 1736, August 1975, p. 1.
Oil and Gas Journal. Worldwide Construction. V. 73, No. 16, Apr. 21, 1975, p. 109.
Progress. Three Plants of Special Oil Products Planned. V. 19, No. 8, March 1975, p. 1.

[22] U.S. Embassy, Islamabad, Pakistan. State Department Telegram 515, January 1976, p. 1.

The Mineral Industry of Peru

By Orlando Martino [1]

The Peruvian economy experienced a lower rate of growth during 1975. The rate of growth of the gross domestic product (GDP) declined in 1975 to 4% for the year, compared with an average annual rate of growth of almost 6% during 1972–74. The rate of inflation was a record high, increasing to 24% compared with the 10.6% average annual increase for the 10 preceding years.

Peru's mineral production declined 10.4% in 1975 and accounted for 7% of the estimated GDP of $12.2 billion [2] at current prices, compared with 8.2% of the GDP in 1970. Mineral exports valued at $560 million accounted for 45% of Peru's export earnings in 1975.

Peru's export-oriented mineral industry was dominated by the copper, lead, zinc, silver, and iron ore sectors. Together they accounted for 97% of mineral exports value in 1975. Other mineral production, including bismuth, indium, molybdenum, rhenium, selenium, tellurium, and tungsten comprised the remaining 3%. The United States received a substantial portion of Peru's mineral exports.

Government Policies and Programs.— The year 1975 marked the beginning of the Second Development Plan (1975–78), which was to concentrate on channeling investment into basic industrial sectors and bring into operation in 1977 and 1978 the large projects undertaken in oil and copper.

The investment program for 1975–76 for the mining sector included the Cuajone copper project, the Cerro Verde copper mine, the Lima zinc and Ilo copper refineries, and the Bayovar phosphate project. Principal investments in the petroleum industry for the same biennial included completion of the Trans-Andean oil pipeline, continuation of oil and gas exploration, and the expansion of the Pampilla oil refinery.

By Decree Law No. 21094 of February 4, 1975, the Government of Peru promulgated a new organic law for the energy and mines sectors of the economy and to govern the basic structure and functions of the Ministry of Energy and Mines. This law also provided that the public enterprises and institutions operating in these sectors will abide by the general policies formulated by this Ministry. The public enterprises included were as follows:

Empresa Minera del Perú (Minero Perú),
Petroleos del Perú (PETROPERU),
Electricidad del Perú (ELECTROPERU);

and the public institutions included were as follows:

Instituto Peruano de Energia Nuclear
Instituto Cientifico y Tecnologico Minero (INCITEMI),
Instituto de Investigaciones Energeticas y Servicios de Ingenieria Electrica,
Instituto de Geologia y Mineria (INGEOMIN), and
Registro Publico de Mineria.

Minero Perú, PETROPERU, and ELECTROPERU were Government enterprises in the fields of mining, petroleum, and electricity operating under their own bylaws and statutes. INCITEMI was in charge of mining research and INGEOMIN was in charge of planning, directing, and executing all the activities related to geo-

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[2] Where necessary, values have been converted from Peruvian Soles (S/) to U.S. dollars at the rate of S/45.0=US$1.00.

logical studies in Peru, as well as the exploration, appraisal, and inventory of the country's mineral resources. The Registro Público de Mineria was responsible for recording all mining concessions and rights granted by the State. This new organic law replaced Decree Law 17527 of March 1969.

In September, Peru and Canada signed two loan agreements totaling $8 million; the first loan was for use by the Banco Minero to finance the Polymetallic Development Program within the medium mines sector, and the second for Corporación Financiera de Desarrollo (COFIDE), the Government development corporation.

In July, the assets of Marcona Mining Co. were nationalized by Decree Law 21228. This company was Peru's sole iron ore producer and exporter and had been in operation since 1953.

In late August, General Morales Bermudez assumed the presidency of Peru. A new junta was appointed including Army General Luis La Vera Velarde as Minister of Energy and Mines. Subsequently, on September 26, 1975, the sol was devalued 16% and a program of economic austerity was under preparation.

By Decree Law 21297 of October 1975, the Government reserved for the State the exclusive right to explore, exploit, and refine radioactive substances found in Peru. Any radioactive substance obtained as a byproduct of the processing of other substances would be under the control of the Peruvian Nuclear Energy Institute.

PRODUCTION

Mineral production declined 10.4%, in 1975 owing in part to strike-related work stoppages at the principal copper mines. In addition, high costs closed some of the smaller mines. Iron ore production suffered the greatest reduction, declining 19%. Other production declines in commodities of significance were copper (9%) and crude oil (6%). Silver production, on the other hand, increased almost 8% and zinc production increased about 2%. The copper output did not reflect the production potential of the Cuajone project which was in its final stages of development. The sharp drop in crude oil production from the Continental Shelf was not compensated by new production in the Amazon areas. Production of refined products increased 4.8%.

During 1975, a total of 77,900 were employed in the mining sector, exclusive of fuels, 71,000 of which were in metallics and 6,900 in nonmetallics or employees of contractors.[3] This represented a 7% increase in employment over 1974. The Department of Junin, east of Lima, had the largest number active in mining at 13,144.

Data on mineral production are shown in table 1.

[3]Anuario Minero Comercial (Lima). La Mineria en el Peru—1976. V. 13, p. 26.

Table 1.—Peru: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
METALS			
Antimony:			
Mine output, metal content	[r] 686	317	277
Metal (content of antimonial lead bars)	324	266	107
Arsenic, white	1,386	1,973	1,260
Bismuth:			
Mine output, metal content	[r] 577	665	614
Metal	512	615	500
Cadmium:			
Mine output, metal content	[r] 572	487	334
Metal	[r] 232	182	160
Copper:			
Mine output, metal content	[r] 202,686	211,593	193,249
Copper sulfate	1,074	4,640	1,104
Metal:			
Blister	[r] 133,978	137,547	120,426
Refined	[r] 38,977	38,955	36,589
Gold:			
Mine output, metal content ____troy ounces	[r] 94,816	100,400	78,796
Metal ____do	[r] 58,427	66,865	56,734
Indium ____kilograms	3,459	2,369	1,588
Iron and steel:			
Iron ore and concentrate ____thousand tons	8,964	9,525	7,753
Pig iron (excluding blast furnace ferroalloys) ____do	[r] 253	303	300
Steel, ingot and castings ____do	[r] 356	450	440
Lead:			
Mine output, metal content	[r] 183,413	165,798	177,643
Metal	[r] 82,880	80,234	71,001
Manganese:			
Ore and concentrate, gross weight	[r] 7,781	1,634	1,634
Metal content	[r] 2,342	492	612
Mercury ____76-pound flasks	3,580	3,252	1,530
Molybdenum, mine output, metal content	[r] 633	650	651
Selenium, refined ____kilograms	7,689	7,747	6,678
Silver:			
Mine output, metal content ____thousand troy ounces	[r] 37,412	34,881	37,527
Metal ____do	[r] 16,775	17,914	17,861
Tellurium, metal ____kilograms	[r] 26,261	36,474	21,164
Tin, mine output, metal content	[r] 233	155	153
Tungsten, mine output, metal content	[r] 854	703	582
Zinc:			
Mine output, metal content	[r] 390,576	378,029	384,800
Metal, refined	[r] 67,095	68,957	63,239
NONMETALS			
Barite	332,502	357,797	[e] 360,000
Calcite	415	--	NA
Cement, hydraulic ____thousand tons	[r] 2,360	1,919	[e] 1,800
Chalk	3,070	385,664	NA
Clays:			
Bentonite	5,445	12,916	[e] 13,000
Fire	41,096	5,459	NA
Kaolin	1,180	4,077	[e] 4,100
Common	68,530	131,623	NA
Diatomite	3,483	2,410	[e] 2,400
Feldspar	2,485	4,088	[e] 4,100
Gypsum, crude	25,850	348,548	[e] 350,000
Mica	1	4	5
Phosphate, guano [e]	23,000	23,000	20,000
Salt, all types	301,067	338,215	[e] 350,000
Stone:			
Dimension, Marble [1]	3,003	11,958	NA
Crushed and broken:			
Dolomite	--	5,239	NA
Gravel and sand ____thousand tons	1,973	2,612	NA
Limestone ____do	1,378	3,224	NA
Quartz and quartzite	3,081	3,373	NA
Silica	1,182	4,791	NA
Sulfuric acid and oleum	55,689	49,630	48,580
Talc, pyrophyllite, and related materials	79,952	13,781	[e] 14,000
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite	10,220	150	[e] 150
Bituminous	--	180	[e] 200
Coke, all types	11,000	[e] 12,000	[e] 12,000

See footnotes at end of table.

Table 1.—Peru: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Gas natural:			
Gross production ____ million cubic feet__	64,005	69,848	67,037
Marketed ____ do____	34,184	35,697	[e] 35,000
Natural gas liquids:			
Natural gasoline [2] ____ thousand 42-gallons barrels__	[r] 427	426	NA
Propane ____ do____	[r] 292	763	NA
Butane ____ do____	3	3	NA
Total ____ do____	[r] 722	1,192	663
Petroleum:			
Crude ____ do____	25,767	28,069	26,384
Refinery products:			
Aviation gasoline ____ do____	2	3	1
Motor gasoline ____ do____	[r] 11,743	11,812	12,995
Jet fuel ____ do____	1,743	1,915	1,844
Kerosine ____ do____	[r] 4,493	4,596	4,696
Distillate ____ do____	7,123	7,325	7,271
Residual fuel oil ____ do____	[r] 10,923	12,763	12,786
Lubricants ____ do____	[r] 97	86	87
Other:			
Liquefied petroleum gas ____ do____	516	534	1,202
Asphalt ____ do____	[r] 230	216	230
Unspecified ____ do____	159	116	208
Refinery fuel and losses ____ do____	[r] 311	370	317
Total ____ do____	[r] 37,340	39,736	41,637

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] Includes crushed marble.
[2] Includes hexane.

TRADE

The total value of mineral exports from Peru was $560 million, a 30% decrease from that of 1974. The mineral export figure for 1974 was revised to $800 million. Mineral exports in 1975 represented 45% of total export earnings. The Peruvian Mining Society reported the following data for 1975 for Peru's leading mineral commodity exports:

Commodity	Quantity	Value, f.o.b. (million dollars)	Share of value (percent)
Copper ____ metric tons__	156,500	161	29
Iron ____ do____	3,025,900	52	9
Lead ____ do____	128,100	41	7
Silver ____ thousand troy ounces__	34,200	140	25
Zinc ____ metric tons__	405,500	149	27
Other minerals ____ do____	NA	17	3
Total ____	XX	560	100

NA Not available. XX Not applicable.

The United States, Europe, and Japan were the major markets for Peruvian mineral exports. In 1975, Peru started to export crude oil from the new Amazon fields to Brazil and a small quantity to Argentina. Exports of refined products decreased 73% to 1.6 million barrels.

Crude oil imports increased over 53% from 11.2 million barrels in 1974 to 17.1 million barrels in 1975. Imports of refined petroleum products increased.

The Eighth Annual Conference of Ministers of the Conseil Intergouvernemental des Pays Exportateur de Cuivre (CIPEC) held in Lima, November 17–20, 1975, was attended by Ministers of the four member countries—Chile, Zaire, Zambia, and Peru. Indonesia was formally admitted as a new full member and Australia and Papua New Guinea were given nonvoting associate member status. At the conclusion of the conference, it was announced that CIPEC countries would continue their 15% export production cutback until June 30, 1976, in order to correct the world supply and demand imbalance. It was also stated that CIPEC will initiate a dialogue between producing and consuming countries with a view to negotiating a copper price stabilization agreement.

Shortly after nationalization of the Marcona Mining Co., Peru joined the Association of Iron Ore Exporting Countries, together with Venezuela, Algeria, Chile, India, Australia, and Mauritania.

Table 2.—Peru: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1972 [1]	1973 [1]	1974 [1]	Principal destinations, 1974
METALS				
Aluminum:				
Bauxite and concentrate	29	NA	--	
Metal including alloys, all forms	83	130	--	
Antimony ore and concentrate	1,555	699	530	Japan 251; Brazil 149; Belgium-Luxembourg 100.
Arsenic trioxide	111	229	288	All to Argentina.
Bismuth metal including alloys, all forms	679	489	620	Belgium-Luxembourg 310; United States 211.
Cadmium metal including alloys, all forms	195	140	253	United States 104; Netherlands 73; United Kingdom 41.
Copper:				
Ore and concentrate	163,323	113,022	77,596	Japan 49,656; United States 20,381.
Matte	2,125	1,290	1,230	Spain 884; West Germany 296.
Copper sulfate	1,585	547	368	Colombia 161; West Germany 86; Switzerland 40.
Metal including alloys:				
Unwrought:				
Blister	144,175	134,188	135,091	United States 88,698; West Germany 15,847.
Refined	28,936	22,725	27,428	People's Republic of China 14,298; Argentina 7,767.
Semimanufactures	2,128	5,212	7,716	Colombia 2,404; Venezuela 2,063; El Salvador 1,047; Costa Rica 806.
Gold:				
Ore and concentrate	[2] 1,064	[2] 1,922	NA	
Metal, content of mixed bars troy ounces	[2] 7,845	[2] 6,591	NA	
Iron and steel:				
Ore and concentrate (excluding pyrite) thousand tons	8,019	8,588	10,487	Japan 5,422; Netherlands 1,738; United States 1,722.
Metal:				
Pig iron, including cast iron	--	--	13	Mainly to Bolivia.
Semimanufactures	571	806	3,698	Chile 1,494; Bolivia 1,017; Equador 643.
Lead:				
Ore and concentrate	165,729	190,085	153,481	United States 71,791; Japan 31,820; Belgium-Luxembourg 17,699.
Oxides	81	453	1,014	Venezuela 538; Colombia 252; Panama 124.
Metal including alloys, all forms	79,982	65,883	83,638	United States 43,764; Italy 17,242; People's Republic of China 10,998.
Mercury 76-pound flasks	4,662	2,813	2,711	United States 1,971; Japan 350.
Molybdenum ore and concentrate	2,087	1,100	1,366	Belgium-Luxembourg 404; France 392; Netherlands 185; West Germany 158.
Selenium, elemental	8	7	7	Netherlands 2; Mexico 2; United States 2.
Silver:				
Ore and concentrate	18,537	20,018	NA	
Metal including alloys thousand troy ounces	19,199	11,065	18,697	Japan 13,414; United States 3,226.
Tellurium, elemental	9	10	28	United States 15; Netherlands 5.
Tin:				
Ore and concentrate	355	252	598	All to United Kingdom.
Metal including alloys, all forms	32	93	NA	
Tungsten ore and concentrate	1,756	1,380	1,051	United States 578; Japan 324.

See footnotes at end of table.

Table 2.—Peru: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1972 [1]	1973 [1]	1974 [1]	Principal destinations, 1974
METALS—Continued				
Zinc:				
Ore and concentrate	642,587	655,725	670,707	Japan 281,684; France 87,958.
Oxide	810	723	NA	
Metal including alloys, all forms	60,535	53,774	62,178	United States 26,101; Brazil 13,548.
Other:				
Ore and concentrate	8,898	--	NA	
Scrap and waste, nonferrous, n.e.s	12	98,640	50,393	Spain 36,393; Belgium-Luxembourg 14,000.
Metal including alloys, all forms	2	5	2	All to United States.
NONMETALS				
Barite and witherite	215,331	292,798	357,977	United States 261,743; Netherlands 46,893.
Cement, hydraulic	48,775	54,728	19,893	Mainly to Equador.
Clays, bentonite	161	101	147	Colombia 101; Equador 46.
Fertilizer materials, crude	25	136	47	Equador 30; Bolivia 16.
Gypsum	2	7	--	
Precious and semiprecious stones, including diamond thousand carats	--	15	--	
Salt	356	3,842	--	
Stone, sand and gravel:				
Stone:				
Marble	350	290	228	Colombia 169; Italy 59.
Travertine	163	48	--	
Sand, not metal bearing	1,741	--	--	
Talc	--	11	1	All to Equador.
MINERAL FUELS AND RELATED MATERIALS				
Coal	NA	50	95	Chile 50; Bolivia 45.
Petroleum:				
Crude thousand 42-gallon barrels	1,170	127	NA	
Refinery products: [3]				
Gasoline do	1	1	NA	NA.
Distillate fuel oil do	161	761	202	NA.
Residual fuel oil do	793	2,394	2,477	NA.
Lubricants do	4	([4])	([4])	NA.
Other:				
Liquefied petroleum gas do	36	10	2	NA.
Unspecified do	3	6	5	NA.
Total do	998	3,172	2,686	

NA Not available.
[1] Source unless otherwise noted: Ministerio de Commercio. Estadistica del Commercio Exterior, 1972, 1973, 1974. Lima, Peru.
[2] Source: Sociedad Nacional de Mineria y Petróleo. Minero Perú, 1974, Lima, Peru.
[3] Source for 1973 and 1974: Ministerio de Energia y Minas. Estadistica Petrolera, 1973. Lima, Peru, p. 107; 1974 p. 102.
[4] Less than ½ unit.

Table 3.—Peru: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1972	1973	1974	Principal sources, 1974
METALS				
Aluminum:				
Bauxite and concentrate	4,380	1,173	4,499	Surinam 2,325; Guyana 2,128.
Oxide and hydroxide	1,979	1,932	2,129	Mainly from United States.
Metal including alloys, all forms:				
Scrap	5,160	6,114	6,847	Venezuela 3,887; Canada 2,437.
Unwrought and semimanufactures	2,356	2,839	2,519	United States 467; Belgium-Luxembourg 324.
Antimony metal including alloys, all forms	19	NA	38	Japan 22; Brazil 10; Denmark 5.
Chromium:				
Ore and concentrate	NA	57	3,991	United States 2,005; Philippines 1,986.
Oxide and hydroxide	30	39	32	West Germany 20; Japan 9.
Metal including alloys, all forms ---kilograms--	307	NA	1,503	United States 944; Switzerland 523.
Copper:				
Ore and concentrate	1,461	1,093	572	Bolivia 421; Ecuador 151.
Matte	NA	1	2	Mainly from United Kingdom.
Metal including alloys, all forms	851	955	1,463	Japan 716; United States 262; West Germany 218.
Gold metal, unworked or partly worked---troy ounces--	707	643	5,722	Switzerland 5,015; West Germany 707.
Iron and steel:				
Ore and concentrate	1,898	25	NA	
Metal:				
Scrap	6,394	10,189	21,166	Mainly from United States.
Pig iron, ferroalloys, and similar materials	215	293	1,396	France 721; United States 522; West Germany 153.
Steel, primary forms	720	12,170	1,972	Japan 1,076; United Kingdom 731.
Semimanufactures:				
Bars, rods, angles, shapes, sections	16,138	38,853	78,590	Japan 38,087; United States 22,855; West Germany 7,528.
Universals, plates, sheets	68,070	108,581	134,028	Japan 50,670; United States 33,802; Canada 14,969.
Hoop and strip	3,033	3,670	14,203	United States 11,155; Japan 1,905.
Rails and accessories	792	1,513	4,167	United States 1,992; France 1,613.
Wire (excluding wire rod)	4,232	3,838	5,189	Japan 2,174; Belgium-Luxembourg 973; West Germany 944.
Tubes, pipes, fittings	19,356	16,998	84,339	Japan 44,809; United States 36,355.
Castings and forgings, rough	1,782	3,314	2,506	Italy 1,304; United States 900; Spain 302.
Lead metal including alloys, all forms	20	15	25	United Kingdom 17; Japan 6.
Magnesium metal including alloys, all forms	11	16	11	United States 6; Denmark 4.
Manganese:				
Ore and concentrate	1	NA	NA	
Oxide	1,500	1,495	1,751	Japan 733; Netherlands 438; United States 373; Belgium-Luxembourg 186.
Mercury---76-pound flasks--	18	18	NA	
Nickel metal including alloys, all forms	64	90	77	West Germany 34; Republic of South Africa 16.
Platinum-group metals and silver, metal including alloys:				
Platinum group-troy ounces--	578,713	1,284,903	1,303,035	Mainly from United States.
Silver ---do---	4,726	64	NA	
Tin metal including alloys, all forms	238	306	217	Mainly from Bolivia.
Titanium oxide	1,741	2,025	1,973	Finland 625; West Germany 414; Belgium-Luxembourg 308.

See footnotes at end of table.

Table 3.—Peru: Imports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1972	1973	1974	Principal sources, 1974
METALS—Continued				
Zinc:				
Oxides	9	17	7	West Germany 5; United Kingdom 1.
Metal including alloys, all forms	125	116	134	Japan 49; Canada 40; United States 19; West Germany 14.
Other:				
Ore and concentrate, n.e.s	NA	220	350	Mainly from Australia.
Oxides, hydroxides, peroxides of metals, n.e.s	755	847	138	Norway 77; West Germany 24; Netherlands 16.
Metal including alloys, all forms	3	646	7	Switzerland 2; West Germany 2; Japan 1.
NONMETALS				
Abrasives, natural, n.e.s.:				
Pumice, emery, natural corundum, etc	92	120	113	United States 37; West Germany 28; Netherlands 14; Norway 11.
Grinding and polishing wheels and stones	191	285	254	Spain 67; Italy 41; Colombia 37.
Asbestos	7,653	8,166	7,839	Canada 5,992; Mozambique 504.
Barite and witherite	107	15	29	Italy 20; United States 6.
Boron materials, oxide and acid	136	257	175	United States 143; Argentina 20.
Cement	2,549	5,738	5,072	West Germany 3,295; United States 1,260.
Chalk	1,176	835	646	Mainly from France.
Clays, crude, n.e.s.:				
Bentonite	1,042	1,105	1,965	Mainly from United States.
Kaolin	1,724	2,224	2,227	United States 1,952; United Kingdom 268.
Other	1,711	2,005	2,793	United Kingdom 1,259; West Germany 852.
Diamond, all grades value, thousands	$717	NA	$842	Belgium-Luxembourg $482; Venezuela $232; United States $126.
Diatomite	1,755	1,082	1,471	Mexico 1,156; United States 298.
Fertilizer materials:				
Crude, phosphatic	3,975	11,384	13,908	All from United States.
Manufactured:				
Nitrogenous	14,166	18,223	30,197	Netherlands 13,559; Norway 7,880; West Germany 6,371.
Phosphatic	592	247	50	All from United States.
Potassic	8,263	9,107	6,759	Canada 3,986; United States 2,770.
Mixed	294	4,497	207	United States 171; Japan 34.
Fluorspar	457	2,436	1,983	Republic of South Africa 1,586; United States 274.
Graphite, natural	57	42	44	United States 20; United Kingdom 12; Norway 8.
Gypsum and plasters	412	177	603	Mainly from United States.
Magnesite	NA	NA	14	Australia 4; United States 4; Italy 4.
Mica, all forms	183	135	93	United States 52; West Germany 24; France 10.
Pigments, mineral, including processed iron oxides	26	35	40	United Kingdom 24; Italy 10; West Germany 6.
Salt	443	234	236	United Kingdom 148; United States 67.
Sodium and potassium compounds n.e.s.:				
Caustic soda	6,994	5,361	8,960	United States 4,457; West Germany 1,944; Libya 1,099.
Caustic potash, sodic and potassic peroxides	107	104	65	West Germany 44; United States 12.
Soda ash	NA	19,655	10,054	United Kingdom 8,202; United States 1,546.
Stone, sand and gravel:				
Dimension stone, crude and partly worked	905	701	696	Italy 588; West Germany 108.
Dolomite	--	--	730	All from Spain.
Gravel and crushed rock	47	54	52	Mainly from Belgium-Luxembourg.
Quartz and quartzite	56	9	14	Do.
Sand, excluding metal bearing	912	1,714	2,019	Mainly from United States.

See footnotes at end of table.

Table 3.—Peru: Imports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1972	1973	1974	Principal sources, 1974
NONMETALS—Continued				
Sulfur:				
Elemental, all forms	7,427	11,860	10,258	Mainly from Venezuela.
Sulfuric acid	(2)	(2)	1	Mainly from West Germany.
Crude	1	19	20	All from United States.
Talc and related materials	949	953	913	Italy 344; Taiwan 128; United States 108.
Other nonmetals, n.e.s.:				
Oxides and hydroxides of strontium, barium, magnesium	256	136	246	Mainly from United States.
Bromine, iodine, fluorine	2	4	3	West Germany 2; France 1.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	68	35	624	Mainly from United States.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	218	232	139	All from United States.
Carbon black and gas carbon	1	--	NA	
Coal, all grades, including briquets	41,670	49,629	44,778	All from United States.
Coke and semicoke	1,225	210,374	113,258	Mainly from Japan.
Peat	11	19	NA	
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	11,953	11,652	11,158	Ecuador 7,026; Venezuela 1,401.
Refinery products: [3]				
Gasoline:				
Aviation do	253	271	223	NA.
Motor do	398	111	151	NA.
Kerosine do	NA	NA	108	NA.
Jet fuel do	43	69	342	NA.
Distillate fuel oil do	--	89	526	NA.
Residual fuel oil do	1,399	1,081	1,042	NA.
Lubricants do	314	267	311	NA.
Other:				
Liquefied petroleum gas do	NA	143	345	NA.
Naphtha, unfinished do	NA	382	496	NA.
Unspecified do	106	1,309	964	NA.
Total do	2,513	3,722	4,508	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	2,610	2,703	3,798	Colombia 3,091; United States 844.

NA Not available.
[1] Data may differ substantially from that appearing in previous editions due to current availability of official Peruvian import statistics.
[2] Less than ½ unit.
[3] Source: U.S. Bureau of Mines International Petroleum Annual.

COMMODITY REVIEW

METALS

Bismuth.—Peru continued to be one of the world's largest producers of bismuth. Refined bismuth was produced as a byproduct of lead at the La Oroya smelting and refinery complex of Empresa Minera del Centro del Perú (CENTROMIN). On the basis of CENTROMIN's preliminary figures, output decreased about 19% in 1975.

Copper.—In 1975, Peru ranked 10th in world mine production and 4th in estimated reserves. Copper production declined 9% chiefly because of strikes at the large copper mines. High costs forced certain smaller mines to close.

Southern Peru Copper Corp. (SPCC), a consortium of four U.S. companies, suffered a decline in copper production at its open pit mine at Toquepala because of labor strikes covering 71 calendar days compared with 27 days lost in 1974. SPCC was Peru's largest copper producer and accounted for 56% of the country's total output in 1975. On July 1, 1975, SPCC entered into a commercialization agreement with Minero Perú Comercial (MINPECO) under which this government agency will take title to and market all production from the Toquepala mine. CENTROMIN was the second largest producer of copper contributing about 23% of Peru's total production with about 36,000 tons.

The most important event concerning new projects in 1975 was the completion of financial arrangements to develop the Cuajone project of SPCC in the Department of Moquegua, south of Arequipa, 16 kilometers from Toquepala. Financing, totaling $404 million for the $620 million project, involved 54 different lending institutions in several countries. In mid-1969, costs were estimated at $355 million. By yearend 1975, $560 million had been invested and 85% of the construction completed. Twenty-seven kilometers of tunnels on the railroad extension to haul concentrates from Cuajone to the SPCC Ilo smelter was completed. The smelter was being expanded to treat Cuajone's output.

When the Cuajone open pit project enters production in the second half of 1976, it will have a mine production of 40,000 tons of ore per day and about 154,000 tons of blister copper per year, making SPCC the operator of one of the world's largest mining-metallurgical complexes. Cuajone's output will increase Peru's copper production 80%. The Cuajone ore body was estimated to contain 430 million tons of sulfide ore averaging 1% copper and 0.02% molybdenum.

CENTROMIN made plans on a priority basis to expand its mine and concentrator at Cobriza, east of Lima in the Department of Huancavelica. A feasibility study to expand production from 2,000 to 7,000 tons of ore per day was carried out by R. M. Parsons Co. On the basis of this study, CENTROMIN and a World Bank mission made an economic evaluation of the plans and recommended expansion to 10,000 tons per day. The expansion, estimated to cost $161 million, was expected to be financed by the World Bank, Inter-American Development Bank, and COFIDE.

Development work was underway by Minero Perú on the superjacent Cerro Verde/Santa Rosa deposits located in the Department of Arequipa. In stage 1, the Cerro Verde deposit, of which half is oxide ore, was being developed first. By yearend, most of the infrastructure work, access roads, and water installations had been completed. Work continued on the solvent-extraction, electrowinning, and anode plants. Cost of stage 1 was estimated at $189 million, $87 million of which was invested by yearend. The balance will be invested in the first half of 1976 when stage 1 is scheduled to be in operation, producing 33,000 tons of copper per year. Stage 2 development involved the Santa Rosa sulfide deposit. The engineering-economic feasibility study for stage 2 was completed and Minero Perú was seeking financing for the project estimated to cost $1.3 billion. When completed in 1980, stage 2 would add about 150,000 tons per year to copper capacity and include a smelter-refinery complex, to be built at Matarani.

A feasibility study was completed during 1975 by the Michiquillay Copper Corp. of Japan of the Michiquillay porphyry copper deposit located in northern Peru, northeast of Cajamarca. Over $700 million will be required to exploit ore reserves estimated to be over 544 million tons grading 0.69% sulfide copper. The Japanese consortium of five copper smelters was awaiting the Peruvian Government's decision with respect to financing the infrastructure for exploitation of the mine, as well as the formation of the Michiquillay Special Mining Co. on a 51%–49% equity basis with Minero Perú.

During 1975, planning continued by CENTROMIN to develop its open pit project at Toromocho, located in Morococha, 160 kilometers east of Lima. By yearend, the fourth drilling program was almost completed. In addition to the open pit mine, the $491 million project will include a concentrator, smelter, and refinery to produce 108,000 tons of refined copper per year.

The new copper refinery at Ilo, located on the coast of southern Peru to handle the present and future output from Toquepala and Cuajone, came onstream in October. The $57 million plant of Minero Perú was constructed by Mitsui Mining & Smelting Co. Ltd. and Furukawa Mining Co. Ltd., and had a rated capacity of 150,000 tons of copper per year. In August, the Government approved a technical-economic feasibility study for the $76 million stage 2 expansion of the Ilo refinery to 300,000 tons per year. This study will also be made by the Mitsui-Furukawa group. Expanded refinery production is to be primarily exported, since domestic demand for refined copper is small.

In August, Seltrust Engineering Ltd. of London completed a feasibility study for the rehabilitation and expansion of the copper circuit at CENTROMIN's La Oroya complex. Output of refined copper was to be increased from 39,000 to 73,000 tons per year. Total cost of the project was estimated at $141 million.

Gold.—Gold metal production decreased 15% compared with that of 1974. CENTROMIN, with 31,046 troy ounces produced as a byproduct in its La Oroya smelter, continued to be Peru's major producer, followed by Cia. Minera Ocona in the Department of Arequipa with 14,300 troy ounces, which was the only major lode gold mine operator.

The increase in gold prices in 1974 prompted a major investigation of the country's gold mining potential. The main gold project under consideration by Minero Perú was the San Antonio de Poto project located in the Ananea District in the Department of Puno, which was expected to produce 39,000 troy ounces of gold per year by 1978.

Iron Ore.—There was a marked decrease in production of iron ore in 1975 and a moderate reduction in exports, from 10.5 million tons in 1974 to about 9.4 million tons in 1975.

By Decree Law 21228 of July 24, 1975, the assets of Marcona Mining Co., a wholly-owned subsidiary of Marcona Corp. based in San Francisco, were nationalized. The Marcona Mining Co., Peru's sole iron ore producer, had been in operation since 1953. The Marcona Corp. noted that its Peruvian subsidiary had been conducting negotiations since the fall of 1974 for the sale of its net assets, but no agreement had been reached. The decree specified that the Marcona assets would be administered by a new autonomous State entity called Empresa Minera de Hierro del Perú (HIERRO PERU). In August, a multisectoral commission was established by the Peruvian Government to determine the assets of the company that were subject to expropriation. Subsequent to the expropriation action, a new president assumed control in Peru and Marcona's management was invited to resume discussion with Peruvian officials regarding just compensation. By yearend these negotiations had not been concluded.

In September, HIERRO PERU first announced that since August 1 it had temporarily reduced its iron ore production 30% as a strategic measure while the world markets made certain adjustments. It was also mentioned that MINPECO was contacting Marcona's former clients to secure sales for HIERRO-PERU.

Decree Law 21234 of August 5, 1975 was published, by which the Peruvian Government approved the agreements reached to establish the Association of Iron Ore Exporting Countries, involving Chile, Venezuela, India, Algeria, Mauritania, and Australia.

Iron and Steel.—In 1975, there was a small decrease in production of raw steel. The only major steel plant, operated by the Government-owned Empresa Siderúrgica del Peru (SIDERPERU) at Chimbote, was undergoing expansion from a yearly output of 425,000 tons to 700,000 tons of raw steel, scheduled for yearend 1975. Mitsubishi Heavy Industries was constructing a tinplating plant at Chimbote on a turnkey basis.

Peru was planning two additional expansion projects, one involving SIDERPERU's existing steelworks at Chimbote, north of Lima, and an entirely new project at San Nicolas on the coast south of Lima, referred to as the Nazca project, and which was being planned by Industrias del Perú (INDUPERU). Although the proposed Nazca project would be less than 32 kilometers from the former Marcona iron ore facilities, complete infrastructure, including a port and water pipeline, would have to be built. At yearend, a decision had not been reached on the Nazca expansion. INDUPERU contracted for two independent feasibility studies on the Nazca project. The first, prepared by the U.S.S.R., was submitted to INDUPERU in December 1974; the other was being prepared by Arthur G. McKee & Co. of the United States.

In October, it was reported that the Ministry of Industry had approved the first stage of a major expansion at the Chimbote works at an estimated cost of $1 billion. Annual production capacity is to be increased to 1.4 million tons per year of ingot steel in the first stage, and to 2.3 million tons in the second stage by 1981.

The feasibility study on this project was prepared by a French firm.

Lead.—There was a 7% increase in lead production during the year. CENTROMIN continued to be the country's major refined lead producer at the La Oroya complex. Other important lead producers were Cia. Minera Atacocha, Cia. Minera Milpo, Cie. des Mines de Huaron, and Cia. Minera Raura. In November 1975, CENTROMIN signed a contract with Kaiser Engineers of Oakland, Calif., for a basic engineering study of a new $26.6 million lead sintering plant at La Oroya.

Worldwide, Peru ranked fifth in mine production and fifth in reserves, which were estimated at 4 million tons of lead.

Silver.—Peru was among the world's largest silver producers. Production of silver in 1975 increased almost 8%. Silver continued as an important mineral export, ranking third after copper and zinc in value. Silver export earnings in 1975 were $140 million, with 43% going to the United States, the main market. The largest silver producer continued to be CENTROMIN, which produced it as a byproduct from the smelting and refining of copper, lead, and zinc.

Of Peru's total production in 1974, 49% was in the form of refined silver, 2% in sterling, 11% in copper bars, and 38% in ores and concentrates.

INCITEMI was planning to build a silver refinery with a production capacity of 3.5 million troy ounces per year near the Ilo copper refinery.

Zinc.—In 1975, Peru ranked fourth in mine production of zinc. After copper, zinc was the second most valuable Peruvian export in 1975. CENTROMIN continued to be the major producer with 45% of national output.

As one of its priority projects, CENTROMIN was planning to expand its zinc refinery at La Oroya from 70,000 to 90,000 tons per year. The feasibility study was completed in April 1975. In November, CENTROMIN signed a contract with the consulting firm Surveyer, Nenninger and Chenevert of Montreal to prepare the basic engineering studies.

In November, the Peruvian Government approved a $77.5 million contract between Minero Perú and the Syndicat Belge d'Enterprises S.A. (SYBETRA) for the construction of a 75,000-ton-per-year zinc refinery to be located at Cajamarquilla, 38 kilometers east of the port of Callao. Input for the new refinery was to be supplied by mines in the central Andean region producing about 200,000 tons of zinc concentrates, which were being exported unrefined. Completion was expected in 1978.

NONMETALS

Cement.—Production of portland cement has almost quadrupled since 1960 when output was about 600,000 tons. In February 1975, the Minister of Industry stated that Fabrica Cementos Lima in Lima, Fabrica de Cemento Pacasmayo in La Libertad, and Fabrica Cemento Yura in Arequipa will be expanded so that Peru can remain self-sufficient and would have a surplus to export by 1978, when total output is planned to be 3.5 million tons.

Fertilizer Materials.—Minero Perú completed a feasibility study for the development of the phosphate rock deposits in the Sechura Desert of northern Peru, as a part of the Government program to establish a fertilizer and petrochemical complex at Bayovar.

The Talara fertilizer complex built for PETROPERU by Toyo Engineering of Japan began commercial production in April. The design capacity was 168,000 tons per year of nitrogenous fertilizer materials. During 1975, 48,000 tons of urea was produced.

MINERAL FUELS

Coal.—The combined production of anthracite and bituminous coal has been decreasing since 1969 when total production was 161,800 tons. Production in 1975 was insignificant.

KOPEX of Poland and Universal Engineering of Switzerland were negotiating with ELECTROPERU and Minero Perú for a detailed technical-economic feasibility study of the proposed Alto Chicama coal mining-energy complex. A preliminary feasibility study of the Alto Chicama anthracite coal deposit, north of Trujillo, was completed by KOPEX in 1974. Based on their findings, KOPEX recommended development of a mine followed by construction of a thermo-electric powerplant. The proposed 480-megawatt plant would supply energy for the Michiquillay copper project and the fertilizer-petrochemical complex at Bayovar.

KOPEX completed its study of the Oyon deposits, east of Huacho in the Department of Lima, reported to contain coal suitable for blending with coking coals. Further evaluations by an independent consultant indicated that the infrastructure costs alone would be too high for exploitation in the near future.

Petroleum. — The Government-owned PETROPERU continued to be responsible for all aspects of the industry from exploration through marketing. In addition to its own extensive operations, seven foreign companies continued to carry out exploration and production service contracts for PETROPERU.

As of January 1, 1975, the Maquia concession, with a production of 1,000 barrels per day, was taken over by PETROPERU. This action completed the termination of the old concession system in accord with government guidelines that called for the abolition of oil concessions.

There was a 6% decline in the production of crude oil compared with that of 1974. A 25% decrease in production on the Continental Shelf was not offset by increased production in the Amazon area. Crude oil production during 1975 was from the northwestern coastal area (49%), the Continental Shelf (40%), and the Amazon jungle area (11%). The country's consumption rate was approximately 113,000 barrels per day compared with a production rate of 65,000 barrels per day. The deficit of 48,000 barrels per day was covered by imports from Colombia, Ecuador, and Venezuela. Total imports of petroleum and petroleum products in 1975 were valued at $227 million.

In March, oil production began in the Shiviyacu Field in the Amazon Basin within the contract area of Occidental del Peru Petroleum Co. By yearend, production from Shiviyacu was averaging 8,000 barrels per day and production facilities were expanded to allow an output of 10,000 barrels per day. The oil was pumped through a pipeline to a storage terminal on the Tigre River and then shipped by barge 720 kilometers to the port of Iquitos on the Amazon River. Occidental's 50% share of production was sold to Petróleo Brasileiro S.A., the Brazilian State oil company.

At yearend, construction was completed on one-half of the 853-kilometer, 24- and 36-inch Trans-Andean pipeline project of PETROPERU to run from San Jose de Saramuro west to the Pacific port of Bayovar. This project, which began in the fall of 1974, was originally estimated to cost $250 million and was expected to be completed by mid-1976. By yearend 1975, it became apparent that the 200,000-barrel-per-day pipeline would not be completed until late 1976 or early 1977 and that the cost of the project would be about $650 million.

Occidental was negotiating a contract with PETROPERU under which the latter would construct and finance a 250-kilometer spur pipeline to the Trans-Andean pipeline from Occidental's contract area. The 16-inch-diameter spur will have a capacity of 80,000 barrels per day and was estimated to cost $115 million. Completion of the spur pipeline was expected in late 1976 or early 1977.

It became evident in 1975 that the optimistic projections made in 1973 for an output of 500,000 barrels per day of crude oil from the Peruvian Amazon Basin would not be realized. The maximum output from the Amazon fields already discovered was estimated at 130,500 barrels per day by 1980. PETROPERU indicated in late 1975 that proved reserves of 11 productive structures amounted to 546 million barrels in the Amazon area, not including additional probable reserves which could amount to 204 million barrels. At yearend, total proven reserves of petroleum in Peru were estimated at 770 million barrels.

At yearend 1975, total refinery capacity in Peru was 113,000 barrels per day. PETROPERU planned to build two new refineries—a 150,000- to 300,000-barrel-per-day unit at the Bayovar terminal, and a 12,000-barrel-per-day refinery near pumping station No. 5 on the Maranon River across from Borja. Additionally, PETROPERU's La Pampilla refinery was to be expanded from a capacity of 37,000 to 100,000 barrels per day by yearend 1976.

The Andean Pact program for the petrochemical sector was approved on August 29, 1975. Twenty products were assigned to Peru. The investments proposed for Peru totaled $420 million. For new projects, feasibility studies would have to be completed within 2½ years and production initiated by yearend 1982. A provision in the agreement permits the establishment of petrochemical plants for non-Andean markets.

The Mineral Industry of the Philippines

By E. Chin [1]

The Philippine economy continued to grow in 1975 in spite of worldwide inflation and falling export demand due to recessions in major markets.[2] At current prices, the gross national product (GNP) reached $15,388 million [3] in 1975, compared with $13,864 million in 1974. In terms of constant 1967 prices, GNP was $5,986 million, showing a real growth of 5.9%, compared with 5.7% in 1974. The net domestic product in 1975 was $4,703 million in 1967 prices; contribution by origin follows: Agriculture, fishery, and forestry, 34%; manufacturing, 25%; services, 17%; commerce, 15%; construction, 3%; mining and quarrying, 2%; and other, 4%.

Output of ores and concentrates containing chromium, copper, gold, iron, nickel, silver, and zinc comprised 71% of the mineral production value.[4] All except nickel were exported for smelting overseas. Copper continued to dominate the mineral industry, providing 42% of the total mineral output value, which was estimated to be around $542 million in 1975 at current prices. The indices of physical volume of production for mining and mineral-related industries in the manufacturing sector were as follows (1965=100):

Sector	1974	1975
Mining:		
Coal	56.7	48.5
Iron	118.4	97.6
Chromium	95.7	98.2
Copper	630.5	815.9
Gold	127.8	106.3
Other	91.4	162.2
Manufacturing:		
Chemical products	119.3	138.1
Petroleum and coal	146.4	173.3
Nonmetallic minerals	134.9	130.2
Basic metals	534.4	411.5
Metal products	179.5	149.5

In 1975, the Philippines traded with 133 countries. The country's largest trading partners were Saudi Arabia, Kuwait, the Netherlands, the United States, Australia, West Germany, Malaysia, Canada, Indonesia, and the United Kingdom, in that order. Petroleum and petroleum products were the principal imported materials by value, while the top three export items were sugar, coconut oil, and copper concentrate.

By yearend 1975, 18 million hectares had been covered by reconnaissance surveys out of a total land area of 30 million hectares targeted for geological survey. Of the 18 million hectares, only 1.4 million hectares were covered by detailed and semidetailed geological surveys. The 1.4 million hectares were estimated to contain 12 billion tons of metallic mineral ore reserves. The amount of Philippine ore reserves contained in this area follows: Gold (primary ore), 0.6 million tons; gold (byproduct ore), 0.2 million tons; copper ore, 650 million tons; iron ore, 1.0 billion tons; nickel ore, 1.1 billion tons; and 225 million tons of other mineral ores including chromite, mercury, zinc, molybdenum, and platinum-group metals. In addition, the country had various other minerals which have not been inventoried such as pyrite, limestone, shale, gypsum, kaolin, feldspar, silica sand, magnesite, dolomite, asbestos, talc, coal, and sulfur.

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[1] Physical scientist, International Data and Analysis.

[2] Monthly Economic Letter. The Philippine Economy: 1975 in Retrospect. V. 7, No. 2, February 1976.

[3] Where necessary, values have been converted from Philippine pesos (P) to U.S. dollars at the rate of P7.248=US$1.00.

[4] Minerals News Service. Philippines. No. 71, August 1976, p. 2.

PRODUCTION

The value of mineral production in 1975, excluding petroleum products, decreased 13% to $542 million. Copper production dominated the mineral sector, comprising 42% of the mineral output value, followed by gold, 15%; chromium, 3%; iron, 2%; silver, 1%; and zinc, 0.8%. Output of portland cement, second to copper in value, dominated nonmetallic mineral production and accounted for 22% of the country's total mineral output value. Output values of other nonmetallic minerals of importance were: Construction materials (principally sand and gravel), $17 million; fertilizers, $6 million; salt, $3 million; gypsum, $2 million; and silica sand, $1.4 million. Output of coal, about double the 1974 production, was valued at $1.8 million. Production of residual fuel oil led total output of petroleum refinery products, followed by gasoline, distillate fuel oil, kerosine, and jet fuel, in that order.

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

Commodity	1973	1974	1975[p]
METALS			
Cadmium mine output, metal content	--	--	15
Chromium, chromite, gross weight:			
Metallurgical grade	95,659	100,415	98,986
Refractory grade	484,609	429,132	421,052
Total	580,268	529,547	520,038
Cobalt mine output, metal content	--	--	106
Copper mine output, metal content	221,195	225,542	225,775
Gold ... troy ounces	[r] 572,250	537,624	501,808
Iron and steel:			
Iron ore and concentrate ... thousand tons	2,255	1,608	1,351
Ferroalloys	1,960	2,213	NA
Lead mine output, metal content	--	1,303	3,388
Manganese ore and concentrate, gross weight	3,973	857	--
Mercury mine output, metal content ... 76-pound flasks	[r] 2,147	812	232
Molybdenum mine output, metal content	--	--	15
Nickel mine output, metal content	399	326	9,500
Platinum-group metals:			
Palladium ... troy ounces	[r] 4,180	2,315	836
Platinum ... do	[r] 2,476	1,350	579
Silver mine output, metal content ... thousand troy ounces	[r] 1,891	1,734	1,620
Zinc mine output, metal content	5,371	7,772	10,453
NONMETALS			
Barite	3,261	[1]	3,803
Cement, hydraulic ... thousand tons	4,059	3,503	4,264
Clays:			
Bentonite	--	--	661
Red	13,411	16,955	18,267
White	18,676	26,701	8,102
Rock	3,245	5,002	756
Other	220,886	1,228,934	442,658
Feldspar	24,998	10,245	3,907
Fertilizer materials:			
Crude, phosphatic:			
Guano	10	13,552	125,813
Phosphate rock	12,228	26,506	5,401
Manufactured:			
Nitrogenous[e] [2]	55,400	53,500	53,400
Mixed and unspecified	56,896	79,126	NA
Gypsum and anhydrite, crude[3]	101,782	126,126	117,983
Lime	151,488	101,262	35,728
Perlite	825	1,131	665
Pyrite and pyrrhotite (including cupreous):			
Gross weight	203,601	164,618	161,560
Sulfur content	94,674	76,547	75,125
Salt, marine	220,000	213,644	70,625
Sand and gravel:			
Alumina sand	21,616	8,596	28,282
Sand, glass ... thousand tons	505	689	427
Sand and gravel, n.e.s.[4] ... thousand cubic meters	5,691	2,161	5,265

See footnotes at end of table.

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

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Stone:			
Coral, crushed ---- thousand cubic meters --	332	57	157
Dacite ----	--	23,923	22,866
Diorite ----	--	56,226	86,325
Dolomite ----	10,455	11,677	5,832
Limestone ---- thousand tons --	4,534	6,588	5,806
Marble (dimension), unfinished ----	9,053	6,529	11,805
Tuff ----	38,667	59,296	49,165
Cobbles and boulders, n.e.s ---- thousand cubic meters --	216	227	47
Talc ----	1,634	2,333	1,342
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades ----	39,004	50,746	105,128
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels --	16,477	14,369	16,294
Jet fuel ---- do ----	2,033	2,060	2,391
Kerosine ---- do ----	3,351	2,822	3,259
Distillate fuel oil ---- do ----	12,432	11,959	13,526
Residual fuel oil ---- do ----	24,286	20,607	23,815
Other ---- do ----	3,046	2,643	3,013
Refinery fuel and losses ---- do ----	4,066	3,759	3,531
Total ---- do ----	65,691	58,219	65,829

e Estimate. p Preliminary. r Revised. NA Not available.
1 Revised to none.
2 Data are for year ending June 30 of that stated.
3 Includes synthetic.
4 Includes unspecified earths.

TRADE

Total trade in 1975 was $5,754 million, down 2% from the 1974 figure.[5] Exports decreased from $2,725 million in 1974 to $2,295 million in 1975. However, imports increased 10% to $3,459 million in 1975. The largest import items were mechanical and electrical machinery, apparatus, and appliances, 23.4%; mineral fuels, lubricants, and related materials, 22.3%; transport equipment, 8.7%; foodstuffs, 6.9%; base metals, 6.2%; and chemicals, 4.4%. By value, shipments from Japan accounted for 28% of the Philippines' total imports, followed by the United States, 22%; member nations of the Organization of Petroleum Exporting Countries, 17%; countries of the European Economic Community (EEC), 12%; and others, 21%.

Food products, principally sugar, coconut oil, desiccated coconut, bananas, and pineapple, constituted 41% of total exports, or $94.3 million, followed by plant fibers, 9.6%; lumber products, 9.4%; copper concentrates, 9.2%; gold ore, 3.3%; and others, 27.5%. Principal export destinations were Japan, the United States, EEC, and others, in that order. In 1975, the value of mineral and metal products represented 17% of all exports. Table 2 indicates the quantity and value of major mineral products exported during 1975.

[5] Monthly Economic Letter. RP External Trade in 1975. V. 7, No. 3, March 1976, p. 2.

Table 2.—Philippines: Selected mineral and metal exports, 1975

Commodity	Quantity (metric tons)	Value (thousands)
Metals and metalliferous ores:		
Cadmium metal ----	21	$97
Chromium ----	486,766	20,085
Cobalt metal ----	1	217
Copper ----	779,681	209,954
Gold ----	15	76,184
Iron ----	1,511,810	13,961
Lead ----	4,040	564
Molybdenum ----	31	74
Nickel ores and concentrates ----	238	149
Nickel metal ----	8,386	33,185
Silver ----	48	6,275
Zinc ----	15,125	3,237
Nonmetallic minerals:		
Cement ----	690,011	26,104
Perlite ----	100	3
Pyrite ----	59,358	917
Quartz ----	3,000	93

Table 3.—Philippines: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal including alloys, all forms	2,803	4,253	Japan 2,235; Oman 744; Hong Kong 600.
Chromium, chromite ore and concentrate	598,153	641,817	United States 230,460; Japan 202,779.
Copper:			
Ore and concentrate	783,803	861,306	Japan 809,439; United States 27,701.
Metal including alloys:			
Scrap	2,520	2,235	Republic of Korea 1,174; Spain 317; Japan 273.
Matte	8	25	Switzerland 19; United Kingdom 6.
Unwrought and semimanufactures	(1)	(1)	All to Australia.
Gold:			
Bullion ---- thousand troy ounces	182	167	All to United Kingdom.
Metal, rolled, unworked or partly worked ---- do	293	374	Japan 299; United States 55.
Iron and steel:			
Ore and concentrate ---- thousand tons	1,966	1,121	Japan 1,118.
Crude, unroasted pyrite ---- do	--	71	Japan 66; Republic of Korea 5.
Roasted pyrite ---- do	43	5	All to Taiwan.
Scrap	--	450	Belgium 250; Netherlands 200.
Metal, semimanufactures:			
Bars, rods, angles, shapes, sections	1,848	4	Guam 3; Indonesia 1.
Universals, plates, sheets	177	1	All to Guam.
Hoop and strip	--	10	All to Hong Kong.
Wire	7	6	All to Thailand.
Tubes, pipes, fittings	952	665	Guam 225; Indonesia 196; United States 192.
Castings and forgings	22	103	Japan 102.
Lead:			
Ore and concentrate	--	769	All to Japan.
Metal including alloys, unwrought and semimanufactures ---- kilograms	140	2,850	All to Hong Kong.
Manganese ore and concentrate	2,464	2,127	Taiwan 1,127; Japan 1,000.
Mercury ---- 76-pound flasks	1,314	250	Australia 150; United States 100.
Molybdenum ore and concentrate	--	17	All to United States.
Nickel:			
Ore and concentrate	2,841	2,437	All to Japan.
Metal waste and scrap	70	--	
Silver metal including alloys, unworked and partly worked:			
Silver, including silver gilt and platinum-plated silver ---- thousand troy ounces	290	201	Japan 134; United Kingdom 51; France 16.
Rolled ---- do	151	311	Hong Kong 309.
Titanium oxide and hydroxide	5	--	
Zinc:			
Ore and concentrate	10,652	14,216	Japan 12,416; United States 1,800.
Oxides and peroxides	20	--	
Metal including alloys:			
Scrap	1,098	436	Taiwan 390; Japan 46.
Unwrought, ingots, slabs, and pigs	50	5	Mainly to Hong Kong.
Other:			
Ores and concentrates, n.e.s	3,861	9,929	United States 9,271; Japan 639.
Ash and residue containing nonferrous metals	343	532	Belgium 312; Japan 150; Taiwan 54.
Base metals, including alloys, all forms, n.e.s	(1)	2	Mainly to United States and Japan.
NONMETALS			
Asbestos	--	83	All to Indonesia.
Cement, hydraulic	988,653	756,697	Saudi Arabia 156,879; Hong Kong 140,433; Oman 125,746.
Chalk	120	--	
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s ---- kilograms	884	103,929	All to Taiwan.
Products:			
Refractory (including nonclay bricks) ---- value, thousands	$3	--	
Nonrefractory ---- do	$3,960	$4,854	United States $1,682; Singapore $1,410; Hong Kong $969.

See footnote at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Diamond, industrial ---------- carats --	3,000	--	
Feldspar and fluorspar	50	1	All to Japan.
Fertilizer materials:			
Manufactured:			
Mixed	9,500	--	
Other, n.e.s	10	--	
Ammonia	28	3	All to Guam.
Pigments, mineral, natural, crude kilograms --	114	--	
Salt	--	72	All to Hong Kong.
Sodium carbonate (soda ash)	100	--	
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Marble	20	--	
Other	r 191	102	Guam 55; Hong Kong 42; United States 5.
Worked:			
Marble	897	756	Japan 428; Singapore 120; Taiwan 105.
Other	4	26	Guam 16; Hong Kong 10.
Gravel and crushed stone	70	2	All to Guam.
Quartz and quartzite	3,600	9,800	Japan 5,000; Taiwan 4,800.
Sand:			
Natural (river and sea)	265	279	United Kingdom 84; Netherlands 82; Japan 45.
Silica	99	101	All to Guam.
Other	3	1	All to Hong Kong.
Sulfur, elemental, all forms	8,251	2,100	All to Japan.
Other nonmetals, n.e.s.:			
Crude	332	701	Malaysia 302; Thailand 195; Taiwan 118.
Oxides and hydroxides of magnesium, strontium, barium	--	1	All to Pakistan.
Slag, dross and similar waste, not metal bearing	--	4,550	All to Republic of Korea.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	3,746	261	Indonesia 144; Guam 82; Hong Kong 35.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	--	10	All to Guam.
Carbon black	207	162	Malaysia 108; Thailand 30; Taiwan 20.
Hydrogen and other rare gases	--	2	All to Indonesia.
Petroleum refinery products:			
Gasoline:			
Aviation thousand 42-gallon barrels --	1	2	Mainly to United States.
Motor (includes motor spirits) do ----	270	74	United States Trust Territory of the Pacific Islands 46; Guam 28.
Kerosine and jet fuel ------ do ----	457	239	United States 115; Guam 39; United States Trust Territory of the Pacific Islands 34.
Distillate fuel oil ---------- do ----	1,828	359	United States 125; United States Trust Territory of the Pacific Islands 100; Guam 56.
Residual fuel oil ---------- do ----	822	227	United Kingdom 52; Panama 35; Liberia 30.
Lubricating oil (includes grease) ---------- do ----	43	61	Singapore 57.
Other:			
Liquefied petroleum gas ---------- do ----	233	39	Mainly to Hong Kong.
Naphtha ---------- do ----	39	--	
Mineral jelly and wax - do ----	--	(1)	All to Taiwan.
Asphalt ---------- do ----	23	39	Guam 34; United States Trust Territory of the Pacific Islands 4.
Petroleum pitch and coke ---------- do ----	164	--	
Unspecified ---------- do ----	--	4	Guam 2; United States Trust Territory of the Pacific Islands 2.
Total ---------- do ----	3,880	1,044	

r Revised.
[1] Less than ½ unit.

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

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite ore and concentrate	39	5,681	Malaysia 5,670.
Metal including alloys:			
Scrap	127	212	Hong Kong 152; United States 60.
Unwrought	15,259	18,393	United States 9,724; Australia 5,601.
Semimanufactures	1,798	2,246	Japan 854; United States 465.
Arsenic trioxide, pentoxide, acids	176	98	West Germany 41; France 40; United States 17.
Chromium oxide and hydroxide	120	115	West Germany 78; United States 15.
Cobalt oxide and hydroxide	3	2	Mainly from Belgium.
Copper:			
Ore and concentrate	3,000	--	
Copper sulfate	10	57	Mozambique 25; Belgium 19; West Germany 11.
Metal including alloys:			
Scrap	56	--	
Unwrought	3,376	4,782	Japan 2,787; United States 1,992.
Semimanufactures	2,350	3,634	Japan 1,806; Australia 732; United States 724.
Gold leaf and gold foil -- troy ounces	397	48	All from United States.
Iron and steel metal:			
Scrap	4,314	17,316	United States 15,317; Australia 1,999.
Pig iron, cast iron, powder, shot	22,550	46,303	Australia 35,316; Japan 10,287.
Ferroalloys	5,143	10,861	Japan 3,846; Belgium 1,475; Taiwan 1,219.
Steel, primary forms	222,123	555,535	Japan 356,547; Australia 146,073; United States 36,853.
Semimanufactures:			
Bars, rods, angles, shapes, sections	40,201	84,650	Japan 61,640; Australia 8,387; France 5,017.
Universals, plates, sheets	302,150	164,515	Japan 132, 590; Australia 15,874; United States 8,537.
Hoop and strip	20,915	28,198	Japan 25,635; United States 1,039.
Rails and accessories	1,278	3,807	Japan 2,046; Australia 873.
Wire	12,844	17,030	Japan 12,658.
Tubes, pipes, fittings	27,388	20,884	Japan 12,717; Australia 2,907; United States 2,901.
Castings and forgings	3	233	Japan 158; Italy 59.
Lead:			
Oxides	41	66	United States 43; West Germany 20.
Metal including alloys, all forms	5,267	4,867	Australia 3,475; United States 1,084.
Magnesium metal including alloys, all forms	4	29	United States 19; Japan 3; United Kingdom 3.
Manganese:			
Ore and concentrate	2,433	1,192	All from United States.
Oxide and dioxide	1,102	1,370	Japan 891; Belgium 142.
Mercury -- 76-pound flasks	8	6	Netherlands 4.
Molybdenum:			
Ore and concentrate	50	35	United States 34.
Metal including alloys, all forms	114	147	Canada 102; United States 43.
Nickel metal including alloys, all forms	154	234	United States 57; Australia 54; Canada 45.
Platinum and platinum-group metals, unwrought and semimanufactures troy ounces	40	3	All from United States.
Silver:			
Silver leaf and silver foil -- do	393	5,680	West Germany 4,365; United States 1,315.
Silver, including silver gilt and platinum-plated silver, unwrought and semimanufactures -- do	185	--	
Tin:			
Oxides	1	(1)	All from Japan.
Metal including alloys, all forms	r 661	1,020	Malaysia 792; Japan 194.
Titanium:			
Rutile ores and concentrates	615	552	Australia 546.
Oxide and hydroxide	4,507	3,219	United States 1,429; Australia 629.
Tungsten metal including alloys, all forms		4	United States 3.
Zinc:			
Ore and concentrate	185	15	All from Japan.
Oxide and peroxide	r 796	1,331	Australia 354; Taiwan 299; United Kingdom 266.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Zinc—Continued			
Metal including alloys:			
Scrap	20	25	All from New Zealand and Western Samoa.
Unwrought and semi-manufactures	12,044	13,410	Australia 6,607; United States 3,433; Japan 1,230.
Other:			
Ores and concentrates of base metals, n.e.s	30	323	Australia 283.
Ash and residue containing nonferrous metals	179	--	
Oxides, hydroxides, and peroxides of metals, n.e.s	127	118	Japan 49; United States 19; West Germany 16.
Nonferrous base metals including alloys, all forms, n.e.s	35	13	Netherlands 8; United States 2.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	478	407	Greece 303; United States 42.
Dust and powder of precious and semiprecious stones	2	25	Mainly from Congo (Brazzaville).
Grinding and polishing wheels and stones	521	774	Taiwan 186; United Kingdom 158; Japan 94.
Asbestos	3,284	4,090	Canada 3,191; Botswana 340.
Barite and witherite	2,361	1,617	United States 746; Singapore 729; India 124.
Boron materials, oxide and acid	589	587	United States 385; Japan 177.
Cement	7,835	8,768	Japan 5,450; United States 1,338.
Chalk ____ kilograms	334	4,536	All from United States.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite and fuller's earth	14,471	5,239	Japan 4,535; United States 684.
Fire clay	203	572	United Kingdom 285; United States 155; Japan 124.
China clay (kaolin)	5,844	8,545	United Kingdom 4,595; Republic of Korea 1,750; Japan 1,177.
Other	15,317	17,971	United States 14,149; Japan 2,205.
Products:			
Refractory (including nonclay brick) __ value, thousands	$3,651	$6,852	United Kingdom $2,027; Japan $1,747; Austria $1,046.
Nonrefractory ____ do	$47	$149	United States $83; Japan $42; Italy $16.
Cryolite and chiolite	1	--	
Diamond, industrial ____ carats	81,100	85,580	Congo (Brazzaville) 68,430; Ghana 17,150.
Diatomite and other infusorial earth	693	1,974	United States 1,886.
Feldspar and fluorspar	2,564	4,456	Norway 1,420; Japan 957; Italy 670.
Fertilizer materials:			
Crude:			
Nitrogenous	50	--	
Phosphatic	171,401	116,756	All from United States.
Manufactured:			
Nitrogenous	156,403	244,464	Japan 96,551; West Germany 47,334; United States 37,209.
Phosphatic	14,201	187,474	Spain 150,000; United States 33,705.
Potassic	84,543	91,990	United States 61,029; Canada 23,690.
Other, including mixed	r 322	196,477	Yugoslavia 88,603; Spain 34,450; France 25,669.
Ammonia	80,048	135,900	Japan 106,200; Australia 29,699.
Graphite, natural	146	160	Austria 30; Japan 30; Republic of Korea 25.
Gypsum and plasters:			
Gypsum	40,007	6,926	Thailand 6,736.
Plasters	4,253	3,705	West Germany 3,423.
Lime	598	499	United States 267; United Kingdom 183; Japan 49.
Magnesite	1,854	2,852	Austria 1,563; Japan 650; Republic of Korea 430.
Mica:			
Crude, including splittings and waste	93	50	United States 33; India 15.
Worked, including agglomerated splittings	19	8	India 3; Japan 2.

See footnote at end of table.

Table 4.—Philippines: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Pigments, mineral:			
Natural, crude	2,650	2,406	United Kingdom 1,306; India 938.
Iron oxides, processed	819	1,061	West Germany 445; India 254; Spain 129.
Precious and semiprecious stones, natural, except diamond ____ carats	17,808	7,500	All from Hong Kong.
Salt	21,184	45,448	Australia 24,962; India 18,631.
Sodium carbonate, natural and manufactured	78,832	91,399	United States 35,685; Kenya 15,600; Japan 14,342.
Sodium compounds, caustic soda	9,198	16,811	Japan 3,515; United States 3,252; Netherlands 2,573.
Stone, sand and gravel:			
Dimension stone, crude and worked	94	102	Italy 43; Austria 31; West Germany 23.
Dolomite	8,662	8,363	Japan 5,700; Austria 1,020; United Kingdom 999.
Gravel and crushed stone	371	479	Japan 231; France 202.
Limestone (except dimension)	1,642	539	All from Japan.
Quartz and quartzite	r 127	236	France 100; Sweden 75.
Sand:			
Silica	7,376	6,121	South Vietnam 6,000; Japan 63.
Other	239	335	Japan 236; United States 58; Taiwan 40.
Stone for industrial uses (including soapstone), n.e.s	202	271	Republic of Korea 100; France 99; Japan 72.
Sulfur:			
Elemental, all forms	10,119	34,912	Iran 32,138.
Sulfur dioxide	181	3	United States 2; Netherlands 1.
Sulfuric acid	r 262	36	United States 25; Japan 7; Italy 2.
Talc	5,779	5,918	Republic of Korea 4,259; Hong Kong 374.
Other nonmetals, n.e.s.:			
Crude	5,032	1,579	United States 583; West Germany 500; Australia 241.
Oxides and hydroxides of magnesium, strontium, and barium	184	543	United States 264; Australia 175; United Kingdom 75.
Bromine, iodine, fluorine	1	1	Mainly from United States and France.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	757	714	United States 257; Brazil 141; Sweden 104.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,151	389	Republic of Korea 300; United States 88.
Carbon black	802	887	United States 630; West Germany 103; Japan 93.
Coal, coke, briquets	10,373	26,634	Japan 19,019; North Vietnam 4,100; Australia 2,129.
Hydrogen and other rare gases	159	204	Japan 178; Australia 10.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	r 68,013	62,275	Saudi Arabia 37,183; Kuwait 15,751; Iran 4,292.
Refinery products:			
Gasoline:			
Aviation ____ do	173	226	Iran 218.
Motor ____ do	(1)	255	Bahrain 216; Singapore 39.
Kerosine and jet fuel ____ do	--	(1)	All from United States.
Distillate fuel oil ____ do	--	3,755	Bahrain 2,784; Saudi Arabia 383.
Lubricants (including grease) ____ do	950	886	Singapore 296; United States 286; Japan 125.
Other:			
Liquefied petroleum gas ____ do	--	96	Singapore 73; Indonesia 19.
Naphtha ____ do	503	1,314	Singapore 845; Saudi Arabia 165; Indonesia 154.
Mineral jelly and wax ____ do	108	96	Indonesia 49; United States 14; People's Republic of China 14.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other—Continued			
Unspecified __ thousand 42-gallon barrels __	14	50	Japan 27; United States 9; United Kingdom 4.
Total ___________ do ____	1,748	6,678	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ______	274	607	Australia 494; Japan 71; United Kingdom 29.

[r] Revised.
[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—West Pacific Alumina Corp., an eight-member consortium, was considering the construction of an alumina plant at Mindanao using bauxite imported from Weipa, Australia. The feasibility study called for an 800,000-ton-per-year alumina plant to be completed by 1980, which would later be expanded to 4 million tons per year.

In 1974, Reynolds International, Inc., signed an agreement of intent to construct a 100,000-ton-per-year aluminum smelter at Ormoc, Leyte Province. A smelter, designed to use indigenous aluminous clays, was being considered. The project was held at abeyance pending the economic availability of power. Swiss Aluminium Ltd. reportedly was considering a 10,000-ton-per-year aluminum smelter at Mindanao.

Chromite.—The bulk of the refractory-grade chromite was mined in Masiloc, Zambales, by Benguet Consolidated, Inc., for Consolidated Mines, Inc. The remainder of the output, 761 tons, was by Superior Mining and Industrial Corp., a new company which began production in January 1975. Three companies produced metallurgical-grade chromite. Acoje Mining Co. Inc., accounted for 98% of the output. Cecilia Estanislao and New Frontier Mines, Inc., new producers of lump ore in 1975, accounted for the remainder. At yearend 1975, the estimated reserves of refractory-grade chromite ore in the Philippines were 6.65 million tons; reserves of metallurgical-grade chromite ore were 1.47 million tons.

Table 5.—Philippines: Production and exports of chromite, 1975

	Quantity (metric tons)	Value (thousands)
Production by company:		
Refractory grade:		
Consolidated Mines, Inc	420,291	$13,169
Superior Mining and Industrial Corp	761	23
Total	421,052	13,192
Metallurgical grade:		
Acoje Mining Co., Inc	96,999	2,905
Cecilia Estanislao	958	26
New Frontier Mines, Inc	1,029	95
Total	98,986	3,026
Exports by country of destination:		
Refractory grade:		
Argentina	3,440	115
Australia	12,565	426
Brazil	8,817	292
Canada	15,229	541
Chile	5,903	201
Italy	10,508	303
Japan	57,611	1,533
Netherlands	26,244	806
Peru	1,981	57
Poland	2,538	47
Taiwan	1,215	45
United Kingdom	35,993	1,185
United States	193,229	5,767
Venezuela	10,849	314
Yugoslavia	9,897	307
Total	396,019	11,939
Metallurgical grade: Japan	90,747	8,146
Total exports	486,766	20,085

Copper.—Production of copper ores and concentrates in 1975 totaled 840,991 tons and was by 11 companies from 12 mines. Apex Exploration & Mining Co., Inc., Consolidated Mines, Inc., and Eastern Rizal Copper Corp., ceased production at yearend 1974, and no mine output was reported for 1975. Output of byproduct copper concentrates totaled 2,319 tons, valued at $316,835, and was by Benguet Exploration Co. (694 tons), Itogon-Suyoc Mines Inc. (508 tons), La Suerte Gold Mining Corp. (157 tons), and Zambales Base Metals, Inc. (960 tons).

Atlas Consolidated Mining & Development Corp. (Atlas), with the largest copper mine in the Philippines, accounted for 41% of the total domestic production in 1975. Installation of a third concentrator at its Carmen ore body was scheduled for completion in 1978, thereby adding 32,000 tons of milling capacity to bring Atlas' total concentrate capacity to 94,000 tons per day. A 130,000-ton-per-year copper smelter, designed to treat the output of the three concentrators, was planned for construction on Bataan, Luzon Island, or Cebu Island, at an estimated cost of $300 million. However, the Government requested Atlas to defer the smelter project until the establishment of a Government-supported copper project, Copper Smelter Corp. of the Philippines (CSCP). The CSCP smelter with an annual output of 84,000 tons of copper was to be sited on Negros Island. Although CSCP is a joint venture of the Government and copper producers, foreign investors were to be invited to participate to the extent of 40% of equity.

Marcopper Mining Corp., the second largest producer of copper, completed expansion of its concentrator throughput capacity to 24,600 tons per day. Philex Mining Corp (Philex), the third-ranking copper producer, completed the expansion of its concentrator from 14,000 tons per day to 24,000 tons per day in July 1975. Under Philex management, the Santo Nino mine of Baguio Gold Mining Co. was expanding the capacity of its concentrator to 7,500 tons per day, to be operational in early 1976. Expansion of the Sipalay mill of Marinduque Mining &

Industrial Corp. was completed during the year. Western Minolco Corp. planned to expand its milling capacity from 15,000 to 22,000 tons per day by mid-1976; a second-stage expansion to 30,000 tons per day was also proposed.

Benguet Consolidated, Inc., conducted geologic testing of several porphyry copper prospects. Indicated ore reserves were estimated at 92 million tons of 0.42% copper for the Dizon prospect, 112.6 million tons of 0.42% copper for the Tayson prospect, and 155 million tons of 0.393% copper for the Tawi-Tawi prospect. Development of the underground mine and the construction of a 20,000-ton-per-day concentrator at Tayson, Luzon, was underway. Estimated cost for the project was $24 million. Benguet Consolidated also planned to develop the Tawi-Tawi prospect and to install a 30,000-ton-per-day mill at the site.

Table 6.—Philippines: Production and exports of copper concentrates, 1975

	Quantity (metric tons)	Value (thousands)
Production by company:		
Acoje Mining Co., Inc	6,513	$818
Atlas Consolidated Mining & Development Corp	343,894	103,631
Baguio Gold Mining Co	16,038	3,761
Benguet Consolidated, Inc	6,257	1,965
Black Mountain, Inc	12,353	3,518
Lepanto Consolidated Mining Co	42,470	15,396
Marcopper Mining Corp	131,834	32,021
Marinduque Mining & Industrial Corp.:		
Bagacay project [1]	47,183	4,748
Sipalay project	96,411	22,147
Philex Mining Corp	102,092	30,408
Philippine Iron Mines Inc	1,405	287
Western Minolco Corp	34,541	7,258
Total	840,991	225,958
Exports by country of destination:		
China, People's Republic of	28,194	9,497
Greece	19,903	4,847
India	13,579	3,286
Japan [2]	665,313	171,500
Taiwan	9,512	2,496
United States	43,180	18,328
Total	779,681	209,954

[1] Includes 21,503 tons of direct-shipping-grade ore, valued at $1,153,470.
[2] Includes 17,253 tons of direct-shipping-grade ore, valued at $1,136,871.

Gold.—Total output of gold in 1975 was 501,808 troy ounces, valued at $79 million. Production by primary producers follows, in troy ounces: Atok-Big Wedge, 3,215; Benguet Consolidated, 127,413; Benguet Exploration, 13,310; Itogon Suyoc Mines, 28,614; La Suerte Gold Mining Corp., 3,922; Manila Mining Corp., 4,115; and Northern Surigao Mining Corp., 482. Gold recovered as a valued byproduct of copper processing totaled 320,703 troy ounces. Principal producers of byproduct gold were Philex Mining Corp., 134,422 troy ounces; Atlas, 79,669 troy ounces; and Lepanto Consolidated Mining Co., 40,478 troy ounces. The remainder of the production was by Marcopper Mining Corp., Western Minolco Corp., Marinduque Mining & Industrial Corp. (Sipalay and Bagacay copper project), and Black Mountain, Inc., in order of output.

The Central Bank of the Philippines contracted with Johnson-Matthey for a gold-silver refinery to be located in Quezon City. The refinery capacity, reportedly sufficient to process domestic concentrates for all of the country's gold-silver bullion production, would be about 610,000 troy ounces of gold and about 450,000 troy ounces of silver. Completion date for the project was scheduled for 1976–77.

Iron Ore.—Inco Mining Corp., the largest iron ore company in the country, produced 722,324 tons of magnetite in 1975; 83% of the output was from its Leyte operation, and the remainder from its Negros operation. During the year, Inco concluded an agreement with Nippon Steel

Corporation of Japan for the purchase of 1 million tons per year of magnetite for 10 years commencing in 1978.

Filmag (Philippines), Inc., produced 595,476 tons of magnetite from beach sands located along the west coast of northern Luzon Island. Filmag announced a $32 million project to establish an iron smelter in the Philippines to produce 75,000 tons of ductile pig iron to be used in the manufacture of specially cast products and specialty steels. This project was expected to be operational by 1977–78.

Philippine Iron Mines accounted for the remainder of iron ore production. Three small operations, Anglo-Philippines Oil and Manufacturing Corp., Atlas, and Long Beach Mining Co., ceased mine production in 1974.

Table 7.—Philippines: Production and exports of iron ore concentrate, 1975

	Quantity (metric tons)	Value (thousands)
Production by company:		
Filmag (Philippines), Inc	595,476	$5,394
Inco Mining Corp	722,324	6,517
Philippine Iron Mines Inc	33,646	600
Total	1,351,446	12,511
Exports by country of destination:		
Japan	1,473,315	13,296
United States	38,495	666
Total	1,511,810	13,962

Nickel.—Mine output of nickel was 9,500 tons in 1975 and was by Marinduque Mining & Industrial Corp. (9,364 tons) and Acoje Mining (136 tons). Production by Acoje Mining was nickel contained in nickel-cobalt sulfide concentrate which was shipped to Japan for smelting. The Nonoc mine and refinery of Marinduque Mining was commissioned in 1974. This operation, based on the Sherritt-Gordon hydrometallurgical process, has a rated capacity to produce 31,000 tons of nickel metal and 4,500 tons of mixed nickel-cobalt concentrate from lateritic ores. The Nonoc refinery, however, had startup difficulties, and plant production reportedly averaged 27.5% of the designed capacity for the whole year.

Rio Tuba Nickel Mining Corp., in a joint venture with Pacific Metals Co. Ltd., a Japanese firm, began the development of a nickel mine and concentrator complex on Palawan Island. Design mine output was 500,000 tons per year of nickel ore with initial production targeted at around 350,000 tons, to be onstream in 1976. Total output was scheduled for export to Japan for ferronickel production. The $34 million project was scheduled for completion in 1978.

Atlas postponed the development of its mine and concentrator project on Palawan Island and the construction of a nickel refinery at Mindanao owing to the high cost of fuel oil. The company, however, was conducting studies to determine the feasibility of using coal in place of oil.

Other Metals.—In 1975, production of silver by 16 companies totaled 1.62 million troy ounces, valued at $7 million. Most of the silver was contained in copper concentrates, which were shipped to Japan for smelting. The gross weight of zinc mine output was 19,113 tons, valued at $4.5 million. Production was by Benguet Exploration (10,801 tons), La Suerte Gold Mining Corp. (17 tons), and Zambales Base Metals, Inc. (8,295 tons). In addition, small amounts of cadmium, cobalt, lead, mercury, molybdenum, manganese, platinum, and palladium were produced; total value of output was estimated at $2.1 million.

NONMETALS

Cement.—Output of cement in 1975 by 15 plants totaled 4.3 million tons, valued at $121 million. Marinduque Mining's Island Cement Corp. produced 565,582 tons, followed by Northern Cement

Corp., 563,652 tons, Republic Cement Corp., 445,382 tons, and Bacnotan Construction Industry Corp., 438,374 tons. The remainder of the production, in order of output, was by Floro Cement Corp., Fortune Cement Corp., Filipinas Cement Corp., Iligan Cement Corp., Hi-Cement Corp., Rizal Cement Co., Inc., Mindanao Portland Cement, Continental Cement Corp., Pacific Cement Corp., Luzon Cement Corp., and Apo Cement Corp. Universal Cement Corp. ceased production in December 1974.

During the year, about 690,000 tons was exported, principally to Indonesia (199,838 tons), Bangladesh (192,333 tons), Saudi Arabia (77,103 tons), Iran (49,002 tons), and Brunei (48,417 tons). The remainder of the cement shipments were to 12 countries in Southeast Asia and the Middle East.

Fertilizer Materials.—Output of guano increased from 13,552 tons in 1974 to 125,813 tons in 1975. Production of phosphate rock on the other hand decreased 80% to 5,401 tons. Production of sulfur remained at the 160,000-ton-level. Most of the output of sulfur was recovered as a byproduct of copper ore flotation and was converted to ammonium sulfate by domestic fertilizer producers. Close to 16,000 tons of limestone production was consumed locally in agricultural uses.

Other Nonmetals.—Clay production in 1975 totaled 470,444 tons. Initial production from the 45,000-ton-per-year bentonite mine and processing plant of Lepanto Exploration, Inc., and Filmag, Inc., was only 661 tons.

Gypsum production decreased 6.5% to 117,983 tons. About 6% of the output was mined; the rest was recovered as a byproduct of phosphate rock processing.

Lime production continued to decline and was 35,728 tons in 1975. Limestone production was 5.8 million tons, of which 98% was consumed locally in the manufacture of cement.

Production of sand and gravel totaled 5.3 million cubic meters. Output of other construction materials, including broken adobe, crushed coral and stone, rock aggregate, stone, cobbles, and boulders, totaled 942,131 cubic meters. Production of unprocessed marble was 11,805 tons; production of processed marble was valued at $1.3 million.

Production of marine salt declined to 70,625 tons from 213,644 tons in 1974. Output value of other nonmetals during 1975 follows: Barite, $106,000; feldspar, $81,000; perlite, $29,000; and talc, $50,000.

MINERAL FUELS

Coal.—Production of coal in 1975 was double the 1974 output and totaled 105,128 tons, valued at $1.8 million. Output by 15 establishments in Cebu Province was 90,847 tons. The remainder was by one mine in Zamboanga del Sur. All production was consumed domestically.

Petroleum.—The Philippines continued to meet its oil demands by imports, primarily from the Middle East. Imports of crude oil in 1975 totaled 9,137,000 tons and were provided as follows, in thousand tons: Saudi Arabia, 4,807; Kuwait, 1,859; Indonesia, 698; Malaysia, 553; People's Republic of China, 414; Iran, 373, Iraq, 336; and other, 97.

By presidential decree of August 25, 1975, all activities relating to the discovery, development, and production of indigenous petroleum resources were placed under a single governmental authority. The powers and duties formerly vested in the Secretary of National Resources were transferred to the Petroleum Board created under Presidential Decree No. 87. The functions of the Petroleum Division of the Petroleum Technical Committee in the Bureau of Mines, together with applicable appropriations, records, equipment, and property, were likewise transferred to the Petroleum Board.

The decree provided that "all holders of valid and subsisting petroleum exploration concessions or published petroleum exploration concession applications under the Petroleum Act of 1949, as amended, shall convert their concession or concession application to a service contract under the terms and provisions of Presidential Decree No. 87, either alone or with any local or foreign oil company or companies within a period of one year from the effective date of this Decree. Any concession or concession application not so converted for any cause within the said one year period, shall be deemed automatically cancelled and the area covered thereby shall become part of the National Reserve Area."

The Philippine National Oil Co.

(PNOC), an arm of the Petroleum Board, mapped out an extensive program to spur exploration. Forty-eight concessions covering 26,000 square miles offshore had been converted to contracts between 1972 and 1975. Concessions covering an area of 45,200 square miles, of which 60% was in offshore areas, remained to be converted; about 50 companies were involved in this conversion process. The companies were encouraged to pool resources and were free to select foreign partners. PNOC's objective was to place exploration rights with companies or groups of companies that have the financial and technological capability to carry out sound and active exploration programs.

The Government forbids any company to make public announcements on drilling operations, and reserves this prerogative for itself; no government announcements were made in 1975. While some oil shows have been reported, no commercial finds have been confirmed. At least seven holes were known to have been drilled offshore Palawan and in the Sulu Sea in 1975 by Amoco Philippines, Inc., Sun Oil Co. (two holes), Champlin Philippines, Inc., Cities Service International Inc., and Phillips Petroleum International, Inc. (two holes).

PNOC budgeted $2.78 million for geological and geophysical surveys in the Cagayan Valley and in central Luzon for 1976. The Chinese Petroleum Corporation (Taiwan) carried out an active drilling program on Cebu Island for several years without success. The company, under contract with Philippine firms, was committed to drill three wildcats in the range of 15,000 to 16,000 feet.

The Mineral Industry of Poland

By Tatiana Karpinsky [1]

In 1975, Poland continued to be the world's 10th largest industrial nation with 2.3% of total world industrial output and about 8% of the total industrial output of CMEA[2] member countries. The country accounted for approximately 7.2% of world coal output, 5% of the production of lignite, 2.5% of the copper, 2.2% of the steel, and 13% of the sulfur.

There are large reserves of coal, lignite, sulfur, copper, salt, and construction materials in Poland, but the country remains deficient in oil, natural gas, iron ore, phosphates, nickel, manganese, tungsten, chrome, and rare earths.

In 1975, Poland was the world's 4th largest producer of bituminous coal and 5th in the production of lignite, 8th in copper ore, 8th in zinc and lead ore, 3d in elemental sulfur, and 12th in salt. Mining contributed about 6% of the country's total industrial output, accounted for 10% of the employment in industry, and 4% of the national labor force.[3] Development of the mining industry accounted for about 14% of annual investment allocated to industrial expansion. In 1975, the Polish mining industry produced over 446 million tons of mineral raw materials, representing a growth of 8.3% compared with the 1974 level.

According to Polish sources, the national income of Poland in 1975 increased about 8% compared with the 1974 level. The value of gross industrial production (in current prices) increased 12%. In agriculture, the value of net production declined 2.6% below the level of 1974. Capital investment in the economy totaled approximately Zl484 billion in 1975,[4] an increase of about Zl60 billion, or 14%, over that of 1974.

Government Policies and Programs.—The final targets of the sixth 5-year plan (1976–80) were approved by the Seventh Congress of the Polish United Workers' Party and ratified by the Polish Sejm in 1976. The new 5-year plan foresees a 42% increase in national income. The plan calls for a 50% increase in gross industrial output and a 17% rise in agricultural production. The basic task of the new 5-year plan is the better utilization of existing production facilities and the achievement of higher technical and quality levels.

Accelerated development was planned for energy and mineral fuel commodities. Extraction of hard coal in 1980 is to increase more than 17% over the 1975 level, and is to reach a total of more than 200 million tons. The generation of electric power in 1980 is to reach 132 billion kilowatt-hours. The goal is to make Poland a net exporter of energy by 1980.

The metallurgical industry is to be expanded and modernized. Production of steel in 1980 is to increase about 40% and is to reach 20 million to 22 million tons. Output of rolled products is to increase 30%; that of steel pipe, almost 30%; and that of cold-rolled sheet metal, 50%. Targets for 1980 call for the production of 425,000 tons of copper, 120,000 tons of lead, 140,000 tons of aluminum, and 260,000 tons of zinc. Production of the electrical engineering in-

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[1] Foreign mineral specialist, International Data and Analysis.

[2] 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.

[3] Muszkiet, T. Polish Mining Industry in the National Economy and in the World. IXth World Mining Congress, Federal Republic of Germany, May 1976, I–18. P. 3.

[4] Where necessary values have been converted from Polish Zloty (Zl) to U.S. dollars at the official exchange rate of Zl3.32=US$1.00 (basic rate), special commercial rate, Zl19.92=US$1.00.

dustry is to expand 67% and that of the chemical industry about 70% with marked increases in the production of petrochemicals, fertilizers, sulfur, and salt.

All branches of industry are to be developed for the export market. The plan calls for a 15% increase in exports per year during the 1976–80 period. Capital investments in Poland for the next 5 years are to be increased 37% to 40% to about Zl2,600 billion. Of this amount, Zl700 billion is to be used for completion of projects already underway and Zl1,900 billion will be invested in new productive capacity.

PRODUCTION

Among the minerals and fuels in the Polish economy, coal is considered the most important because it is the major fuel and because of its significance in the development of the national economy. About 95% of Poland's power generation is based on coal and lignite. The increase in production of hard coal in 1975 was 9.6 million tons, or 5.9%, compared with production in 1974. Lignite production was 39.9 million tons, nearly the same as in 1974. In 1975, there were 68 hard coal mines; 2 underground mines and 7 open pits produced lignite. Of the 340,300 employees in the coal industry, 219,800 were employed at deep mines. Longwall mining of hard coal accounted for about 87% of production in 1975, practically unchanged from 1974.

In December 1975, the Piast mine at Nowy Bierun (south of Katowice) was commissioned. Its target output was set at 24,000 tons per day by 1982. In January 1975, the final decision was made to develop a complex of underground coal mines in the Lublin region. It was assumed that the whole complex of mines in Lublin Basin will produce about 25 million tons per year in 1990. It was planned to develop new coking coal mines in the Rybnik area and to continue the development of a fuel-power complex in the Belchatow region. It was assumed that open pits in the Belchatow region will produce 40 million tons of brown coal per year in the future. There were plans to expand 25 mines, among which were Halemba, Jankowice, Makoszowy, Sosnica, and Ziemowit. The plans also called for the development of two commercial plants for gasifying coal with further processing facilities for chemical products.

Polish output of iron ore decreased from 1.3 million tons in 1974 to 1.2 million tons in 1975. To meet the raw material requirements of rapidly increasing iron and steel production, Poland has been importing iron ore from the U.S.S.R., Sweden, Brazil, and other countries. In 1975, 16.4 million tons of iron ores were imported, an increase of 5.1% in comparison with 1974. In 1975, production of pig iron totaled 7.6 million tons and that of crude steel 15.0 million tons (an increase of 0.4 million tons of steel over the 1974 level).

Imports of pig iron reached 1.8 million tons. Poland's main targets in 1975 were to continue modernization of existing metallurgical plants and to develop the Katowice steelworks. The entirely new Katowice plant is to have two of the largest blast furnaces in Poland (each with a capacity of 3,200 cubic meters), three sinter units, and two 350-ton oxygen converters. The plant is to supply 4.5 million tons of raw steel per year during the first phase of operation, and 9 million tons in the second phase. Production at the plant was expected to start in October 1976.[5] The total cost of construction was estimated at Zl34 billion.

Development of the copper industry continued in the Legnica-Glogow copper region. In 1975, copper ore output amounted to 17.0 million tons, an increase of 3.2 million tons, or 23%, over that of 1974. Production of electrolytic copper amounted to 249,000 tons, an increase of 27.7% over the 1974 level. The growth in mine production of copper was derived from the greater application of mechanized mining methods. Poland will continue modernization of copper mines and processing plants. A new smelter is planned for the Legnica-Glogow complex.

In 1975, lead-zinc ore production reached 4.6 million tons, an increase of 10% over the 1974 level. Production of refined lead increased from 71,600 tons in 1974 to 76,200 tons in 1975, and that of refined zinc from 233,000 to 243,000 tons. To increase production of lead and zinc, a new Imperial Smelting Furnace (ISF) is scheduled to start operation in 1977 at the Huta Cynku

[5] Zolnierz Wolnosci (Soldier of Freedom), Warsaw. May 1976, p. 5.

Miasteczko Slaskie works. Imports of zinc concentrate continued in 1975.

In 1975, production of crude petroleum amounted to 553,000 tons. This was far from meeting national demand, and about 13.3 million tons of crude oil was imported from the U.S.S.R. Poland processed about 13.5 million tons of crude oil in 1975. The Plock plant expansion and activation of the Gdansk plant should enable Polish refineries to meet all domestic petroleum product needs.

Output of natural gas was 5.96 billion cubic meters, and imports of Soviet gas amounted to 2.51 billion cubic meters in 1975. Poland needs gas not only as a fuel, but also for its chemical industry. It was estimated that a complex for fertilizers and other products at Police, near Stettin, will require up to 50% of all the gas now used in Poland.[6]

In 1975, the three sulfur mines produced 4.8 million tons of sulfur, and 3.1 million tons of sulfur was exported.

In 1975, production of different varieties of salt totaled about 3.5 million tons from deposits having total reserves of 46 billion tons. Poland's salt production supplies all of the domestic demand and allows for an export of approximately 200,000 tons annually. Klodawa and Inowroclaw are the two major salt-producing areas in the country.[7]

The total output of construction materials was over 215 million tons in 1975. Fire clays, burnt slate, gypsum slabs, slaked lime, and granite were exported from Poland.

Production of electric energy was 97.2 billion kilowatt-hours, an increase of 6.1% over that of 1974. In 1975, the country exported 2.9 billion kilowatt-hours and imported 2.4 billion kilowatt-hours.

The 1975 production plan for many mineral commodities was met, but natural gas, crude steel, rolled products, petroleum products, and cement production failed to meet the growth rate set for 1975. The year 1975 marked the end of the sixth 5-year plan, 1971–75. According to Polish sources, in this 5-year period, the national income of the country increased more than 50%. The following increases compared with 1970 figures have been reported, in million tons: Raw hard coal, 32; raw lignite, 7; copper ore, over 10; sulfur, over 2; zinc and lead ore, over 1.

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[6] Chemical Week, New York. V. 118, n. 23, June 9, 1976, p. 49.

[7] Page 6 of work cited in footnote 3.

Table 1.—Poland: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum metal, primary	102,000	102,000	103,000
Cadmium metal, primary [e]	350	350	350
Copper:			
Mine output, metal content	[r] 152,000	185,000	[e] 230,000
Metal:			
Smelter	[r] 152,000	185,000	230,000
Refined including secondary	[r] 156,900	194,500	248,600
Iron and steel:			
Iron ore and concentrate, gross weight ----thousand tons	[r] 1,413	1,296	1,192
Pig iron ----do	[r] 7,601	7,654	7,604
Ferroalloys:			
Blast furnace ----do	129	133	148
Electric furnace ----do	158	157	166
Steel:			
Crude ----do	14,057	14,565	15,007
Semimanufactures:			
Rolled, excluding pipe ----do	9,867	10,558	11,085
Pipe ----do	1,012	1,101	1,146
Lead:			
Mine output, metal content	69,500	64,000	65,000
Metal, refined including secondary	68,400	71,600	76,200
Nickel, mine output, metal content [e]	1,500	2,000	2,500
Silver, mine output, metal content [e] ----thousand troy ounces	4,800	5,800	7,400
Zinc:			
Mine output, metal content	210,000	200,000	190,000
Metal, refined including secondary	235,000	233,000	243,000
NONMETALS			
Barite	47,900	51,500	53,500
Cement, hydraulic ----thousand tons	15,548	16,765	18,500
Clays and clay products:			
Crude clays, n.e.s.:			
Bentonite [e] ----do	50	50	50
Fire clay ----do	1,427	1,303	1,380
Kaolin ----do	73	86	84
Products ----do	825	820	[e] 820
Feldspar [e] ----do	30	30	30
Fertilizer materials, manufactured:			
Nitrogenous:			
Gross weight ----do	3,910	4,113	4,330
Nitrogen content [2] ----do	1,365	1,457	1,533
Phosphatic:			
Gross weight ----do	2,890	2,737	3,086
P_2O_5 content [2] ----do	814	823	929
Gypsum and anhydrite:			
Crude [e] ----do	850	850	850
Calcined ----do	297	322	[e] 320
Lime (quicklime and hydrated lime) ----do	[r] 7,686	7,958	8,247
Magnesite, crude	[r] 22,100	23,800	26,850
Salt:			
Rock ----thousand tons	1,260	1,405	1,582
Other ----do	1,818	1,890	1,931
Sodium and potassium compounds, n.e.s.:			
Soda ash ----do	725	729	730
Caustic soda ----do	338	361	392
Stone, sand and gravel:			
Stone:			
Dolomite ----do	2,032	2,221	2,341
Limestone ----do	10,300	8,400	[e] 8,400
Marlstone ----do	90	78	85
Quartzite ----do	97	163	252
Other ----do	12,639	13,960	15,937
Sand (for molding) ----do	533	503	603
Sulfur:			
Native:			
Frasch [e] ----do	2,975	3,718	4,340
Other than Frasch [e] ----do	570	375	431
Total ----do	3,545	4,093	4,771
Byproduct:			
From metallurgy [e] ----do	239	262	267
From petroleum [e] ----do	17	18	18
Total ----do	256	280	285

See footnotes at end of table.

Table 1.—Poland: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous thousand tons	156,630	162,004	171,626
Lignite and brown do	39,215	39,825	39,865
Total do	195,845	201,829	211,491
Coke:			
Coke oven do	16,465	16,973	17,294
Gashouse do	1,235	1,127	1,006
Total do	17,700	18,100	18,300
Fuel briquets, all grades do	1,796	1,789	1,860
Gas:			
Manufactured:			
Town gas million cubic feet	26,627	23,590	31,748
Coke oven gas do	225,695	233,499	237,525
Natural, marketed do	212,840	202,670	210,580
Natural gas liquids thousand 42-gallon barrels	360	436	343
Peat:			
Fuel	4,400	4,500	e 4,500
Agricultural e	35,600	35,500	35,500
Petroleum:			
Crude:			
As reported thousand tons	392	550	553
Converted thousand 42-gallon barrels	2,908	4,080	4,103
Refinery products:			
Gasoline do	18,607	17,578	20,290
Kerosine (presumably including jet fuel) do	1,403	1,217	1,108
Distillate fuel oil do	24,685	26,543	31,772
Residual fuel oil do	22,511	21,419	26,547
Lubricating oil do	2,744	2,744	2,940
Grease do	106	e 100	e 100
Paraffin do	205	323	323
Liquefied petroleum gas do	1,450	1,392	1,659
Bitumen do	5,333	6,308	6,727
Total [3] do	r 77,044	77,624	91,466

e 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

In 1975, Polish foreign trade turnover amounted to Zl75.8 billion, an increase of Zl13.4 billion, or 21.5%, over that of 1974. In 1975, total exports were valued at Zl34.2 billion, an increase of Zl6.6 billion, or 23.9%, over that of 1974, and the value of imports rose to Zl41.7 billion, an increase of Zl6.9 billion, or 19.8%, compared with the 1974 level. The trade balance showed that the deficit increased from Zl7.2 billion in 1974 to Zl7.5 billion in 1975, or 4.2%. Most of the deficit was incurred in trade with non-CMEA countries.

The value of total commodity trade with various groups of countries in 1975 follows:

Country group	Exports		Imports	
	Million zlotys	Percent	Million zlotys	Percent
CMEA and other [1] centrally planned economy countries	20,472	60	19,087	46
EEC [2]	6,289	18	11,610	28
EFTA [3]	1,973	6	4,870	12
Other developed countries	2,506	7	4,059	9
Developing countries	2,921	9	2,025	5
Total	34,161	100	41,651	100

[1] People's Republic of China, Yugoslavia, North Vietnam, and North Korea.

[2] European Economic Community comprising the following countries: Belgium-Luxembourg, Denmark, France, Ireland, Italy, the Netherlands, the United Kingdom, and West Germany.

[3] European Free Trade Association comprising the following countries: Austria, Finland, Iceland, Norway, Portugal, Sweden, and Switzerland.

In 1975, more than one-half of Poland's foreign trade was transacted with the centrally planned economy countries, primarily the U.S.S.R. (31.5% of the total exports and 25.3% of the total imports), East Germany (9.2% exports, 7.5% imports), and Czechoslovakia (8% exports, 5.4% imports). West Germany was the developed country with the largest trade turnover (5.2% exports and 8.1% imports), followed by the United Kingdom, Italy, the United States, France, and Austria.

Among branches of the Polish industry, the electrical and manufacturing sector were the most important in production and trade. In 1975, exports of the electrical and manufacturing industry contributed about 41% of Poland's total exports; coal, coke, and electrical power, 20%; chemical products, 9%; steel products, 7%; and products of remaining industries, about 23%. Of the total value of imports, engineering and manufactures accounted for 41%, steel products 18%, chemical 12%, and petroleum and power 6%.

In 1975, the most significant increases in Poland's exports, compared with those of 1974, were 56% in copper, 36% in petroleum products, 16% in sulfur, and 5% in coke. Decreases in exports were noted for lignite (35%) and hard coal (4%). Substantial increases in Poland's imports included 26% in petroleum, 18.4% in gas, 5.1% in iron ore, and 3.4% in alumina. Imports of steel products decreased 26% in 1975, compared with 1974 figures.

In response to the situation confronting the Polish economy, action was being taken to reduce imports, increase exports, and borrow enough money to overcome what is seen as a short-term foreign exchange scarcity. New investment proposals were being studied with great care. Projects requiring a net foreign exchange expenditure during the next few years being delayed or abandoned, unless they had a particularly high priority in addition to economic viability. Ministries have been assigned targets of foreign exchange balances, and their progress toward these balances is reviewed regularly by the Ministry of Foreign Trade, whose role has been greatly strengthened. If import levels appear too far out of line with export earnings, the Ministry may be deprived of its right to import.

Table 2.—Poland: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal including alloys, all forms	681	9,092	East Germany 8,815.
Cadmium metal, all forms	230	277	U.S.S.R. 175; United Kingdom 62.
Chromium trioxide	422	399	Spain 105.
Copper: Metal unwrought and semimanufactures	49,459	60,595	United Kingdom 27,038; West Germany 21,532; Czechoslovakia 11,603.
Iron and steel:			
Iron ore and concentrate	2,000	--	
Scrap thousand tons	525	465	West Germany 123; Liechtenstein 89; Sweden 61.
Pig iron [1]	4,562	2,657	All to Albania.
Ferroalloys [2]	5,398	508	All to West Germany.
Steel ingots	6,464	4,200	All to Hungary.
Semimanufactures including iron and steel castings thousand tons	1,382	1,448	Czechoslovakia 159; East Germany 149; Romania 136.
Lead:			
Ore and concentrate	33,521	25,522	Switzerland 10,216; France 6,787; West Germany 5,912.
Metal including alloys, unwrought	3,120	8,102	United Kingdom 5,753; Netherlands 1,200.
Zinc metal including alloys, unwrought and semimanufactures	r 97,258	92,678	U.S.S.R. 41,738; United Kingdom 14,952; Czechoslovakia 10,703.
Other metals, nonferrous semimanufactures including alloys	10,508	18,879	U.S.S.R. 5,736; West Germany 4,043; United Kingdom 2,232.
NONMETALS			
Cement	26,653	86,954	Sweden 42,596; Czechoslovakia 9,357.
Clay, refractory and burnt slate	41,188	68,367	Italy 29,101; Hungary 23,297; Austria 9,718.
Fertilizer materials, manufactured, nitrogenous thousand tons	1,034	985	East Germany 234; India 159; Italy 158.
Gypsum and plasters:			
Gypsum do	564	523	Sweden 166; Denmark 141; Norway 99.
Plasters do	35	--	
Lime	57,049	39,915	Mainly to Czechoslovakia.
Salt:			
Brine thousand tons	54	52	France 24; Czechoslovakia 11; Hungary 9.
Rock salt	166	188	Finland 48; Hungary 42; Czechoslovakia 32.
Sodium and potassium compounds, n.e.s.:			
Soda ash thousand tons	177	198	U.S.S.R. 96; Czechoslovakia 28.
Caustic soda do	18	7	Mainly to U.S.S.R.
Stone, dolomite	27,287	38,094	West Germany 14,200; Czechoslovakia 13,185; Denmark 5,857.
Sulfur:			
Elemental thousand tons	2,865	3,024	United Kingdom 456; U.S.S.R. 447; France 408.
Sulfuric acid do	533	635	Switzerland 332; Czechoslovakia 92.
MINERAL FUELS AND RELATED MATERIALS			
Coal and briquets:			
Anthracite and bituminous do	35,857	40,093	U.S.S.R. 9,556; France 3,333.
Lignite and lignite briquets do	5,022	5,199	Mainly to East Germany.
Coke do	2,780	2,992	East Germany 851; U.S.S.R. 683; Yugoslavia 302.
Peat and peat briquets	28,893	27,710	Italy 6,142; Austria 5,616; West Germany 5,359.
Petroleum refinery products thousand tons	1,332	1,177	Denmark 385; Austria 200; Sweden 172.

r Revised.
[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	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	125,228	118,588	Hungary 113,311.
Oxide and hydroxide	243,193	262,566	Hungary 145,080; United States 78,019.
Metal including alloys, all forms	22,811	33,078	East Germany 8,634; U.S.S.R. 3,238.
Chromium, ore and concentrate	175,140	162,266	U.S.S.R. 125,145; Albania 24,163.
Copper metal including alloys, unwrought and semimanufactures	31,015	21,242	Chile 6,803; Sweden 5,487; Czechoslovakia 2,647.
Iron and steel:			
Ore and concentrate ----- thousand tons	r 13,668	15,609	U.S.S.R. 11,379; Sweden 2,528.
Scrap ----- do	198	211	Czechoslovakia 153.
Pig iron [1] ----- do	1,498	1,662	U.S.S.R. 1,623.
Ferroalloys [2] ----- do	11	14	U.S.S.R. 7; West Germany 2.
Steel ingots ----- do	38	155	Czechoslovakia 80; United States 34; Romania 17.
Semimanufactures including iron and steel castings ----- do	r 2,694	3,495	West Germany 881; U.S.S.R. 652; Belgium 418.
Lead metal including alloys, unwrought	23,195	20,298	United Kingdom 4,253; U.S.S.R. 3,998; Yugoslavia 2,994.
Magnesium metal including alloys, all forms	1,308	2,153	U.S.S.R. 2,053.
Manganese ore and concentrate	525,488	555,624	U.S.S.R. 496,012; France 41,442.
Mercury ----- 76-pound flasks	5,279	5,947	United Kingdom 1,015; U.S.S.R. 957; People's Republic of China 870.
Tin metal including alloys all forms	4,836	4,450	Malaysia 1,674; United Kingdom 1,421; Bolivia 635.
Tungsten concentrate	4,394	3,186	United Kingdom 2,564; People's Republic of China 541.
Zinc: Ore and concentrate	125,555	95,187	United States 34,171.
Other, nonferrous semimanufactures, n.e.s	2,325	2,361	West Germany 1,065; United Kingdom 516; Italy 364.
NONMETALS			
Asbestos	83,883	102,609	U.S.S.R. 75,934; United Kingdom 13,584.
Barite	26,522	19,271	Bulgaria 10,490; People's Republic of China 3,891; East Germany 3,045.
Cement ----- thousand tons	1,633	1,214	U.S.S.R. 398; West Germany 300; Romania 134.
Clays crude:			
Fuller's earth	9,749	--	
Kaolin (china clay)	129,354	127,871	Czechoslovakia 43,840; U.S.S.R. 31,794; United Kingdom 28,880.
Refractory clays and burnt slate	19,429	24,974	Mainly from U.S.S.R.
Diatomite	2,961	4,880	United States 3,639; Belgium 976.
Fertilizer materials:			
Crude, phosphatic:			
Apatite, concentrate ----- thousand tons	971	741	All from U.S.S.R.
Phosphate rock ----- do	1,554	2,120	Morocco 1,658; United States 250.
Manufactured:			
Nitrogenous ----- do	31	--	
Potassic ----- do	2,422	2,658	U.S.S.R. 1,577; East Germany 1,042.
Fluorspar	36,132	48,911	East Germany 21,532; People's Republic of China 18,145; North Korea 8,995.
Graphite, natural	9,224	11,014	Austria 7,037; U.S.S.R. 3,293.
Gypsum, plasters	3,436	--	
Magnesite:			
Crude	6,772	--	
Calcined	144,326	174,734	North Korea 69,628; Czechoslovakia 61,306; Yugoslavia 18,950.
Mica	1,848	1,390	India 1,352.
Soda, caustic	--	4,459	Romania 3,000.

See footnotes at end of table.

Table 3.—Poland: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Stone:			
Dolomite	12,290	13,360	Hungary 9,168; Romania 3,680.
Quartz	2,075	1,471	Austria 798; West Germany 670.
Quartzite	10,208	--	
Other	15,842	14,152	Norway 9,402; Finland 3,955.
Talc	23,630	29,714	North Korea 17,169; Czechoslovakia 4,798.
MINERAL FUELS AND RELATED MATERIALS			
Coal and briquets:			
Anthracite and bituminous coal thousand tons	1,195	1,233	U.S.S.R. 839; East Germany 296.
Gas, hydrocarbon:			
Natural million cubic feet	60,388	74,761	All from U.S.S.R.
Manufactured do	189	--	
Petroleum:			
Crude thousand tons	11,140	10,582	U.S.S.R. 9,755.
Refinery products do	3,079	3,019	U.S.S.R. 1,316; Belgium 440.

[r] Revised.
[1] Includes blast furnace ferroalloys.
[2] Includes electric furnace ferroalloys only.

COMMODITY REVIEW

METALS

Aluminum.—Production of aluminum amounted to 103,000 tons in 1975,[8] an increase of about 1.0% over the 1974 level. The aluminum industry experienced severe domestic raw material shortages and depended on imports of bauxite and alumina.

In 1975, alumina imports from Yugoslavia, the United States, Hungary, and West Germany totaled 272,000 tons, an increase of 9,000 tons, or 3.4%, over the 1974 level.

Production of primary aluminum began at the Skawina plant, near Krakow, in 1954. Equipment for this plant was imported from the U.S.S.R. In 1966, a second plant started production of metal, and in 1967 Poland's output of aluminum had reached 92,000 tons. It is estimated that aluminum production may reach 140,000 tons in 1980.

Construction of the first Polish alumina plant, with an annual capacity of 78,000 tons, at Nowiny near Kielce, continued in 1975. It was reported that the plant may be completed in 1978. The thin aluminum strip section of the Konin aluminum works was estimated to have had an annual capacity of 6,000 tons in 1975. Poland's first aluminum mill, to produce 0.1- to 0.2-millimeter foil, was to start operating in the beginning of 1976. In the second quarter of 1976, a production of 370 tons of aluminum foil was planned.

Copper.—The annual economic plan provided for 235,000 tons of electrolytic copper to be produced in 1975, but the output was actually 249,000 tons, a 28% increase over that of 1974.[9] Electrolytic copper production was planned to reach 285,000 tons in 1976, rising to 425,000 tons by 1980 and to 800,000 tons by 1990.[10]

Production of copper ores totaled 17.0 million tons in 1975, an increase of 3.2 million tons, or 23%, over that of 1974. The 1980 goal was 30 million tons.[11] In 1975, Poland exported 90,300 tons of unwrought copper, 32,300 tons more than in 1974, an increase of 56%. It is planned to increase the export of copper products in the future. In 1975, approximately 75% of the export copper was sent to non-CMEA countries.

In 1975, copper ore was extracted from the Lubin, Polkowice, and Rudna mines (with small output from the old Groditz mine, now called Konrad). The Lubin mine started production in 1968, Polkowice in 1972, and Rudna in 1974. The fourth largest mine, the Choroschowice, was under development in 1975. The Lubin and Polkowice mines each had an annual produc-

[8] Maly Rocznik Statystyczny (Concise Statistical Yearbook). Warsaw, 1976, p. 92.
[9] Page 92 of work cited in footnote 8.
[10] Kurier Polski (Polish Courier), Warsaw. December 1975, pp. 1-8.
[11] Journal of Commerce. New York. July 7, 1976, p. 5.

tion capacity of about 5 million tons of ore. The Rudna mine was larger with a projected annual capacity of 7.5 million tons. At the Rudna mine, work was in progress on a new ore concentration plant and a second extraction shaft 1,000 meters deep. The fourth production line of the concentrator, with an annual capacity of 2.5 million tons of ore, was to be put in operation in April 1976. The shaft was to start operation in the third quarter of 1976. The room-and-pillar mining system was the main mining system in use, although shortwall and longwall mining was practiced in some areas.

Two main smelters, one at Legnica and one at Glogow, each a completely integrated plant with smelting and electrolytic refining, were in operation in 1975. The third smelter, at Szopienice, was equipped with an electrolytic refinery and fire-refining furnace for secondary copper. The Szopienice plant also produced Poland's silver, cadmium, and nickel.

Construction of several copper smelters over the 1975–85 decade was planned. The Glogow I plant was completed, and the second stage expansion was to bring its capacity to 160,000 tons of electrolytic copper yearly. The new Glogow II plant, with an annual capacity of 150,000 tons, under a U.S. contract (Textron), was to operate by yearend 1976.[12] Projected capital investment for copper mining and processing during the next 5 years has been set at a level of Zl44 billion.[13]

In the copper mining industry, foreign machinery and equipment were used. The application of new machinery and equipment has resulted in increasing productivity at copper mines.

The Legnica-Glogow copper deposits are located in the Lubin area of Lower Silesia, about 40 miles northwest of Wroclaw. Copper deposits are relatively small and lie at depths of 600 to 1,000 meters. The average copper content is about 1.5%, and proved reserves grading more than 1% of copper were estimated at 1.5 billion tons.[14] The ore deposits lie below water-bearing Tertiary and Quaternary formations, and all shafts had to be sunk using freezing techniques. Rock temperatures in the ore zone range from 28° to 42°C, making heavy demands on ventilation.

Iron and Steel.—In 1975, Poland produced 1.2 million tons of iron ore, a decrease of 104,000 tons, or 8%, from that of 1974, and a decrease of 1.4 million tons, or 53%, from that of 1970. Extraction of iron ore was mainly from mines in the Czestochowa region. Output of iron ore is not large and only partly meets the needs of the Polish industry. The Polish steel industry is almost entirely dependent on imported iron ore, of which 16.4 million tons were purchased in 1975. Imports of iron ore increased in 1975 by 0.8 million tons, or 5.1%, in comparison with those of 1974.

The Soviet Union has for many years been the chief source of iron ore imports. In 1975, approximately 85% of iron ore was imported from the U.S.S.R. and 15% from Sweden, Brazil, and other countries. Under a contract signed at Katowice by Stalexport for Poland and its Soviet counterpart Soyuzpromeksport, the Soviet Union was to supply Poland with 13 million tons of iron, manganese, and chromium ores in 1976.

In 1975, production of pig iron totaled 7.6 million tons, approximately the same as in 1974. Imports of pig iron reached 1.8 million tons and rose 6% as compared with the 1974 level.

In 1975, Poland produced 15.0 million tons of crude steel, an increase of 0.4 million tons, or 3%, over that of 1974. Steel production was expected to reach 16.2 million tons in 1976 and 22 million tons by 1980. In 1975, consumption of steel in Poland was about 19.0 million tons; in 1976, it was expected to total about 20 million tons. The annual increase for steel consumption ranges from 1.0 million to 1.3 million tons.

Output of rolled steel products rose 527,000 tons (5%) over the 1974 level and that of steel pipe rose 45,000 tons (4.1%). Exports of rolled products amounted to 1.3 million tons. Steel products were also an important part of Polish imports. In 1975, imports of rolled products decreased to 1.7 million tons from 2.3 million tons in 1974.[15] Polish steel imports consisted mainly of ingots, thin sheets, and light sections.

In 1975, the main increases in steel demand by industry sector were as follows: Shipbuilding, 50%; agricultural machinery, 22%; automobile industry, 21%; manufacture of metalworking machinery, 11%.

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[12] Kurier Polski (Polish Courier), Warsaw. Sept. 11, 1975, p. 2.

[13] Work cited in footnote 11.

[14] Rudy i Metale Niezelazne (Ores and Nonferrous Metals), Katowice. October 1975.

[15] Page 191 of work cited in footnote 8.

The Lenin Steel Works, near Krakow, produced over 40% of Poland's steel output and was the only Polish producer of special steelplate. Products of this plant were galvanized and tinplate, car body plate, thin cold-rolled sheet, cold-bent sections, electroweld pipe, and ship construction plate. In 1975, the Lenin Steel Works produced 6.8 million tons of steel and employed 38,000 people. Long-range plans call for output of more than 10 million tons per year.[16]

The output of the Lenin Steel Works as a percent of total Polish steel industry output follows:

Item	1970	1975
Coke	23.5	22.9
Pig iron	50.7	47.7
Steel	37.2	36.2
Rolled products	35.4	34.9
Steel pipe	16.5	27.3
Cold-bent sections	92.6	98.6

In 1975, there were five blast furnaces in operation at this plant, including a 2,000-cubic-meter-capacity unit, the largest in the Polish metallurgical industry, three modern converters; one tandem-type open hearth furnace; and an ordinary open hearth furnace. The auto plate rolling mill was put into operation in 1975 and was to produce some 350,000 tons of sheet metal in 1976. Decisions have been made to build a sixth blast furnace with a 2,000-cubic-meter capacity.

Production of silicon steel is expected to start in the beginning of 1976. Silicon steel is to be the 50th steel product to be produced at Lenin Steel Works. In 1975, Poland relied on the Soviet Union for supplies of ferroalloys.[17]

At the Laziska plant, the furnace section was being modernized and transportation and loading operations were being fully mechanized.

The Nowotko Steel Works at Ostrowice was to receive Poland's first continuous steel-casting unit from France in 1976. The works was to produce 300,000 tons of high-grade steel in 1976, to be sent for further processing to plants in Warsaw, Florina, Bobrek, and Dzierzynsk. The Florina Steel Works has been modernized and supplies industry with galvanized and plastic-coated sheet metal.

The Institute for Iron Metallurgy at Gliwice was working on steels with greater corrosion resistance and coordinated all metallurgical research in the country in 1975.

The Katowice metallurgical plant at Losien was to supply its first steel at year-end 1976. In that year, the following units were to start production: The agglomerating plant, blast and steel furnaces, and a rolling mill. The total capacity in 1976 was planned to be 4.5 million tons of steel per year. Construction of rolling mill for finished products at this plant was expected to be completed in 1977. Nearly 30,000 workers were employed at the Katowice construction site in 1975. After 1980, the Katowice metallurgical plant was to produce 9 million tons of steel annually.[18]

In 1975, the following installations were brought into operation: (1) Two coke oven batteries with a capacity of 1.6 million tons per year each at Zaklady Koksowricze Zdzieszowice; (2) three 140-ton electric arc furnaces at the Zawiercie Steel Works; (3) one 140-ton electric arc furnace at the Nowotko Steel Works; (4) the first stage of the cold-rolled sheet mill with a capacity of 350,000 tons per year at the Lenin Steel Works.

In 1976, the following installations were expected to be put into operation: (1) Two coke oven batteries at Zaklady Koksowricze Zdzieszowice coke plant; (2) a blast furnace of 3,200-cubic-meter volume, two oxygen converters of 300 tons each, and a blooming mill with continuous casting at Katowice Steel Works, (3) three electric arc furnaces; (4) a mill for production of cold-rolled transformer steel at Lenin Steel Works; (5) a zinc-galvanizing line with cold forming and plastic coating at Florina Steel Works.[19]

Lead and Zinc.—Lead-zinc ore production reached 4.6 million tons in 1975, an increase of 10% over the 1974 level. Extraction of lead-zinc ore was developing in the Olkusz region, which has the largest reserves. The new Pomorzany underground lead-zinc mine started production in 1974.

In 1975, Poland produced 243,000 tons of refined zinc and 76,200 tons of refined lead. Production of lead increased 6.4%, and zinc output increased 4%. Export of zinc and

[16] Kurier Polski (Polish Courier), Warsaw. Sept. 16, 1975, p. 2.
[17] Metal Bulletin, London. Sept. 23, 1975.
[18] Zolnierz Wolnosci (Soldier of Freedom), Warsaw. Nov. 25, 1975, p. 4.
[19] United Nations Economic and Social Council (New York). Steel. WP.1/R.4/Add 2, Mar. 24, 1976.

zinc-rolled products (excluding alloys) amounted to 91,700 tons, an increase of 800 tons or about 0.8% over that of 1974. In 1975, the import of zinc concentrate increased to 137,000 tons from 95,200 tons in 1974.

In 1975 a new production line for continuous casting of zinc and zinc alloy strip was commissioned at the Silesia Zinc Works in Katowice. The strip, produced directly from molten metal, is used in the production of gutters, pipes, window sills, and batteries. Poland awarded a contract to Lurgi (West Germany) to construct a plant for the processing of lead and zinc sulfide ores. The contract includes an associated sulfuric acid unit using sulfur dioxide offgases as feedstock. These plants were to form part of the expansion of an already existing zinc smelter at Miasteczko Skaskic, near Katowice, scheduled to start up by 1977–78.

NONMETALS

Fertilizer Materials.—The Polish chemical industry produced 1.5 million tons of nitrogen and 0.93 million tons of phosphatic fertilizers in 1975 (in terms of nutrient content). Production of nitrogen fertilizers increased 4.8% compared with 1974 output, and phosphatic fertilizer increased 13.4%. The goals for 1980 were 2.2 million and 1.3 million tons, respectively. The 1975 volume of annual fertilizer production fully covered domestic requirements. Reportedly, consumption of mineral fertilizers increased from 173.6 kilograms per hectare in 1974 to 182.3 kilograms in 1975. About 905,000 tons of nitrogen fertilizers was exported in 1975.[20] East Germany was one of the main importers and in exchange, Poland purchased potash salts from East Germany. Polish fertilizers were also purchased by Pakistan, India, and Indonesia.

There was a shortage of phosphate ores in Poland. In 1975, in terms of nutrient content, 3.3 million tons of phosphorites and apatites were imported, an increase of about 15% compared with the 1974 level.

The fivefold increase in phosphate prices over the past few years has convinced Poland to resume phosphate production and thus reduce imports. The known deposits in the areas lying in a belt from Annopol to Przytyk (west of Radom) contain only 13% to 22% phosphorus pentoxide and lie at great depths. The Poles in 1975 were prospecting for new phosphate deposits between Przytyk and Ilza and in an area north of Lublin.[21] Phosphate fertilizers were produced at Worclaw, Kracow, Szezecin, Ubocz, Bogus, Zowize, Tornobrzey, and Gdansk.

There were five main nitrogen fertilizer plants in operation in 1975—the Chorzow, Tarnow, Kedzierzyn, Pulawy, and Wlockeawek plants. The nitrogen plants at Pulawy and Police converted to the production of high-concentrate and multicomponent fertilizers prior to 1975. Pulawy was Poland's largest ammonia-producing plant, with a capacity of 1 million tons per year.

In 1975, work began on the new melamine plant at the Pulawy nitrogen fertilizer complex. The 32,000-ton-per-year unit was due to start up in 1977. During the process, byproduct ammonia was to be produced. Poland's largest methanol plant came onstream at the P. Finder chemical combine in Chorzow. It had a design capacity of 100,000 tons per year.[22] The nitrogen plant in Tarnow planned to increase production in 1976 by 6.2% by improving labor productivity and management of materials. A large fertilizer plant was to be built next to the existing plants at Police near Szezecin. The plant was to produce nitrogen, phosphorus, potassium fertilizers, ammonia, urea, sulfuric acid, phosphoric acid, and other products.[23] The complex of facilities, worth $385 million was to be built in cooperation with France. The contract was awarded by Cekop to a West European consortium headed by Creusot-Loire Entreprises. The contract called for construction of two ammonia units, each with a capacity of 750 tons per day, a 1,200-ton-per-day urea plant, and a 2,600-ton-per-day complex-fertilizer unit using the Fisons (United Kingdom) process.[24] The first production of fertilizers from the Police complex was to be delivered in the second half of 1980.[25]

The Poles announced plans to build their own seaport on the River Oder at Police by yearend 1980, to ship fertilizers by inexpensive water transport to the interior of Poland.

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[20] Page 192 of work cited in footnote 8.
[21] East-West Markets (New York). Mar. 8, 1976.
[22] Nitrogen (London). No. 98, November/December 1975, p. 18.
[23] Trybuna Ludu (Warsaw). May 21, 1976, pp. 1–5.
[24] East-West Markets (New York). May 17, 1976, p. 3.
[25] Work cited in footnote 23.

Sulfur.—About 90% of sulfur in Poland was extracted by the Frasch process. Poland's sulfur output totaled 4.8 million tons in 1975, a 16.7% increase over that of 1974. It was anticipated that the output of sulfur would increase to about 7 million tons in 1980. Poland had become the world's second largest exporter of sulfur, with 1975 exports reaching a volume of about 3.1 million tons, almost one-third of the total world sulfur exports. The new 1976–80 plan called for annual exports of 5 million tons by 1980. In 1975, about 50% of Poland's sulfur was exported to CMEA countries. The U.S.S.R. imported over 1.5 million tons. Imports of Polish sulfur into market economy countries in 1975 totaled over 1.5 million tons, 23% less than in 1974. Almost all of Poland's market economy customers reduced their purchases of Polish sulfur. The United Kingdom, France, and West Germany, the three biggest, cut purchases 20%, 13%, and 31%, respectively, a total reduction of 225,000 tons. Exports to Finland, the Netherlands, and Norway slightly increased in 1975. The Soviet Union and Czechoslovakia, the most important CMEA purchasers of Polish sulfur, increased their imports by 60% and 46%, respectively, over those of 1974. Polish sulfur was exported in both liquid and granular form. The major export terminal is located at Gdansk.

The geological resources of sulfur in the Tarnobrzeg, Piaseczno, and Grybow area totaled 150 million tons.

Production of sulfuric acid in Poland increased from 3.3 million tons in 1974 to 3.4 million tons in 1975. The lower rate of increase for sulfuric acid production was due to the depressed level of the West European market.[26] In 1975, installed capacity for sulfuric acid production in Poland totaled 3.7 million tons per year. An increase of 300,000 tons per year was expected in 1976 with commissioning of the Gdansk sulfuric acid plant.

MINERAL FUELS

For many years, coal including lignite has been the major source of primary energy in Poland.

Total production of primary energy derived from fossil fuels, fuelwood, and hydroelectric generation rose from 185.1 million tons in standard coal equivalent in 1974 to 195.2 million tons in 1975. In 1975, the share of coal (lignite, anthracite, and bituminous) in the total primary energy production was about 94%; crude oil comprised 0.4%; natural gas, 4.1%; and others (peat, wood, and hydropower), 1.5%. Approximately the same distribution of primary energy production was observed in 1974.

Total consumption of all types of primary energy in Poland increased from 163.1 million tons in standard coal equivalent in 1974 to 179.2 in 1975.

Coal in 1975 produced about 80% of the energy consumed in Poland, compared with 12% for petroleum, 6% for natural gas, and about 2% for peat, wood and hydropower.

The total primary energy balance for 1974 and 1975 is shown in table 4.

In 1975, Poland produced 97.2 billion kilowatt-hours of electricity, up from 91.6 billion kilowatt-hours in 1974, an increase of 6.1%. The installed capacity of electric powerplants was 20,057 megawatts in 1975, an increase of 4.8%. During 1975, about 2.92 billion kilowatt-hours of electricity was exported and 2.41 billion kilowatt-hours imported.[27] The generation of electricity is to be based mainly on hard coal until 1980 and on lignite thereafter. According to Polish sources, nuclear power will supply 13% of Poland's energy needs by 1990. By 2000, the share of nuclear energy is to increase to 40%.[28]

Field studies for Poland's first nuclear power station on Lake Zarnowieckie confirmed the site. The station is to have a final capacity of 1,600 megawatts and is to be linked with a 680-megawatt pumped storage station on the lake. The first stage of the station is to become operational in 1984.

Coal.—During 1975, Poland produced a total of 171.6 million tons of hard coal, an increase of 9.6 million tons, or 5.9%, over that of 1974.[29] Coal production was expected to reach 177 million tons in 1976, 200 million to 210 million tons by 1980, and approximately 250 million tons by 1990.[30] The average daily output achieved by hard coal mines was 8,125 net tons; 23 mines achieved output over 9,000 tons per day.

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[26] Sulphur (London). No. 122, January/February 1976.
[27] Page 115 of work cited in footnote 8.
[28] Trybuna Ludu (Warsaw). Aug. 15, 1975.
[29] Page 92 of work cited in footnote 8.
[30] Polish Foreign Trade (Warsaw). March 1976, p. 26.

Table 4.—Poland: Total primary energy balance for 1974 and 1975
(Million tons of standard coal equivalent) [1]

	Total primary energy	Coal (lignite, anthracite, bituminous) and coke	Crude oil and petroleum products	Natural gas	Other (peat, wood, hydropower)
1974:					
Production	185.1	173.9	0.8	7.6	2.8
Exports	46.2	44.4	1.8	--	--
Imports	24.2	1.2	20.2	2.8	--
Apparent consumption	163.1	130.7	19.2	10.4	2.8
1975:					
Production	195.2	183.6	.8	7.9	2.9
Exports	44.8	42.3	2.5	--	--
Imports	28.8	1.1	24.4	3.3	--
Apparent consumption	179.2	142.4	22.7	11.2	2.9

[1] 1 ton of standard coal equivalent (SCE) = 7,000,000 kilocalories. Conversion factors used are from the United Nations as follows: Hard coal, 1.0; brown coal, 0.3; coke, 0.9; crude oil, 1.47; petroleum products 1.54; natural gas (1,000 cubic meters), 1.33; hydroelectric power (1,000 kilowatt-hours), 0.125.

Source: Concise Statistical Yearbook of Poland, Warsaw, 1976.

About 23% of the total hard coal production was exported in 1975, but total exports of hard coal decreased from 40.1 million tons in 1974 to 38.5 million tons in 1975, a decrease of 1.6 million tons, or 4%, resulting from decreased demand for coal from the European Economic Community (EEC) countries. Poland was the second largest exporter of coal in the world. In 1975, exports of Polish coal accounted for 21% of total world coal exports and about 15% of Poland's overall exports. In 1975, about 62% of the country's hard coal exports went to Western Europe; all non-CMEA countries imported about 23.8 million tons of coal from Poland, and CMEA countries took 14.7 million tons.

In Western Europe, the largest importers of Polish hard coal in million tons were France (3.8), Denmark (3.4), Finland (3.3), and Italy (3.0), followed by West Germany, Spain, and Belgium. Of the overseas countries, Japan was the largest importer, with 1.1 million tons, and Brazil followed with 810,000 tons; other importers included Argentina, the United States, Uruguay, Egypt, Canada, and others. Among the CMEA countries, the U.S.S.R. was the largest importer of Polish hard coal, with a total of 9.7 million tons, followed by Czechoslovakia (2.4 million), East Germany (770,000), Hungary (741,000), Romania, Bulgaria, and Yugoslavia.

Poland was an important producer of brown coal (lignite). In 1975, the country produced 39.9 million tons of brown coal, approximately the same amount as in 1974. Brown coal production was expected to reach 42 million tons in 1980, compared with 32.8 million tons in 1970.[31]

In 1975, about 3.4 million tons of brown coal was exported, a decrease of 1.8 million tons, or 35%, from the 5.2 million tons exported during 1974. The main importers of brown coal were Bulgaria, Yugoslavia, India, East Germany, and Romania. The main brown coal deposits are located in the Wroclaw, Zielenogora, Poznan, and Lodz regions.

Production of coke reached 18.3 million tons in 1975, a 1.1% increase over that of 1974. In 1975, about 83% of Poland's 3.1-million-ton coke exports went to CMEA countries and 17% to the market economy countries. Poland's largest importers of coke among CMEA countries were the Soviet Union and East Germany. Among Western European countries, Austria imported the largest amount of Polish coke, followed by West Germany, Finland, and Switzerland.

In 1975, about 62% of total coal exports was shipped through seaports. Coal and coke loadings at Polish seaports, in thousand tons, are shown in the following tabulation:[32]

[31] Polish Coal Review, Weglokoks, (Katowice). Sole Exporters of Polish Coal and Coke Economic Department 1975. V. 13, No. 10–12/149–151, p. 7.

[32] Polish Coal Review, Weglokoks, (Katowice). Sole Exporters of Polish Coal and Coke Economic Department 1976. V. 14, No. 4/155, p. 4.

Port	Loading in 1975
North Port	6,706
Szezecin	6,475
Swinoujscie	4,091
Gdynia	3,671
Gdansk	2,741

The tabulation shows that the North Port, which commenced operation in 1974, is the most important port for coal shipments.

A new hard coal mine, the Piast, at Nowy Bierun (south of Katowice) was commissioned in December 1975. Its target output is 24,000 tons of coal per day in 1982.[33]

In January 1975, plans for the development of the Lublin hard coal basin were approved by the Polish Political Bureau and the Executive Council of Government.[34] The first mine is to be located in the village of Bogdanka, near Lublin. The whole complex of mines in the Lublin Basin is to produce about 25 million tons per year by 1990. The first shafts at the Bogdanka mine were scheduled to be sunk at yearend 1977, and coal production should begin in 1980.

The other big coal development underway in 1975 was at Belchatow, where opencast operations were to provide 40 million tons of brown coal per year. The Belchatow open pit was to go into operation in 1980 and was planned to reach its target output by 1985. It was planned to develop the Szczercowo mine immediately after completing the Belchatow mine and for it to commence operations in 1985, with planned output of 40 million tons per year.

The newly discovered deposits of hard coal in Lublin Province are estimated at 40 billion tons. Reserves of brown coal at the Belchatow coalfield amounted to 2 billion tons.[35]

Poland has been experimenting with fuel conversion since 1967. The first commercial plant producing liquid fuels from coal was expected to be built in the mid-1980's. Poland participated in coordinated coal research programs with the United States, the United Kingdom, West Germany, and other countries.

Natural Gas.—Gas production in 1975 was 5.96 billion cubic meters, an increase of 0.2 billion cubic meters, or about 3.8%, over the 5.74 billion cubic meters produced in 1974. In addition, about 212 million cubic meters came from draining gaseous hard coal mines, mainly in the Rybnic region. Natural gas deposits in Poland were too small to supply the national demand. Imports of natural gas from the U.S.S.R. totaled 2.51 billion cubic meters, an 18.4% increase compared with 1974. Poland was to receive an additional 2.8 billion cubic meters of gas per year from the U.S.S.R. via the Orenburg pipeline by 1980.

In May 1975, an agreement was signed between CMEA countries and the Soviet Union concerning the construction of the Orenburg gas pipeline to bring Soviet natural gas from the Urals to Eastern Europe. The Polish sector is to be 556 kilometers long, extending from Orenburg (in the southern Ural Mountains) to Alexandrow Gai (at the northern end of Kazakhstan, U.S.S.R.). The total length of the gas pipeline is to be 2,750 kilometers. The Polish section is to be completed in the third quarter of 1978.

Polish-owned gas comes from Carpathian foothill lowland deposits. Poland, the U.S.S.R., and East Germany announced plans for joint exploration of the Baltic Sea shelf.

Petroleum.—In 1975, production of crude oil in Poland amounted to 553,000 tons, an increase of 3,000 tons, or 0.5%, over that of 1974. About 13.3 million tons of crude oil was imported in 1975, an increase of 26%. The Soviet Union supplied Poland with about 90% of its imports of crude oil. About 10% came from the Middle East (mainly Kuwait, Libya, and Iran).[36]

In 1976, the Soviet Union was to deliver to Poland 11.7 million tons of crude oil, and over the succeeding 5 years deliveries to reach 50 million tons of crude oil and 6.5 million tons of petroleum products. At the same time, Polish oil imports from the Middle East were to increase in order to supply the new 3-million-ton-per-year-capacity Gdansk refinery.[37]

In 1975, 13.52 million tons of crude oil was processed in Poland, an increase of 2.11 million tons over 1974 level. In 1976, about 15.5 million tons of crude oil, mainly from

[33] National Coal Board, (London). British Mining Delegation in Poland, Official Report. Coal and Energy Quarterly, No. 8, Spring 1976, p. 21.
[34] Zycie Gospodarcze (Economic Life), Warsaw. Feb. 28, 1975, p. 2.
[35] Page 26 of work cited in footnote 30.
[36] Polish Foreign Trade (Warsaw). May 1976, p. 3.
[37] East-West Markets (New York). Oct. 20, 1975, p. 8.

the U.S.S.R., was to be refined.[38] Plans for the petrochemical industry call for the processing of about 20 million tons of crude oil by Polish refineries in 1980.[39]

In 1975, Poland exported 1.6 million tons of petroleum products and synthetic fuels, which is about 36% more than in 1974. Imports of petroleum products increased by 0.11 million tons, from 3.02 million tons in 1974 to 3.13 million tons in 1975.

Poland's foreign trade in petroleum products (including synthetic fuels) for selected years is shown, in thousand tons, in the following tabulation:

Year	Export	Import
1960	223	1,789
1970	1,316	2,424
1974	1,177	3,019
1975	1,601	3,133

Exports of petroleum products showed a stronger rate of growth than imports. Petroleum products were exported to West European countries, especially to Scandinavia.[40] Some petroleum products were imported from the U.S.S.R. (about 30% to 35%), the United Kingdom, Belgium, Albania, Hungary, and the Netherlands.

At the end of November 1975, the first production unit of the Gdansk refinery (Poland's eighth), started operations; the second unit was to be put into operation in the second half of 1976. During the initial phase of operation, the refinery was to process 3.16 million tons of crude oil per year, and this output was to double after completion of the expansion program. The refinery will supply primarily various types of motor fuels, heating fuel, lubricants, and hydrocarbons for petrochemicals, especially the synthesis of polymers.

The Plock refinery, the largest in Poland, (northwest of Warsaw), according to a Polish source, was processing 240,000 barrels per day of crude oil in spring 1975 and increased its capacity to 300,000 barrels per day in July.

Poland planned to explore its Baltic seabed for oil and gas; to establish a Research Institute of Baltic Geology, and to open a Department of Marine Prospecting at Gdansk University.

[38] Zycie Warszawy (Warsaw's Life), Warsaw. May 28, 1976, p. 2.

[39] Zycie Warszawy (Warsaw's Life), Warsaw. Jan. 9, 1976, p. 1.

[40] Rynki Zagraniczne (Foreign Trade), Warsaw. No. 47, Apr. 17, 1976, pp. 2–3.

The Mineral Industry of Portugal

By Roman V. Sondermayer [1]

During 1975 Portugal remained a modest producer of many minerals and related products. However, its tungsten output accounted for about 4% of the world's total. In addition, coal, tin, gold, copper, iron and steel, feldspar, and cement were the main minerals produced in the country. Their output was only of domestic significance. The mineral industry of Portugal accounted for about 5% of the gross national product (GNP) and employed about 49,500 persons, or 3% of the employed labor force.

There were few significant developments during 1975. Expansion was completed on the petroleum refinery of the Sociedade Anónima Concessionária da Refinação en Portugal S.A.R.L. (SACOR), near Oporto. Construction also continued on a 6-million-ton-per-year refinery located 60 miles south of Lisbon.

The unsettled political climate of the country in 1975 affected its minerals industry and new development and expansion were delayed. However, most existing facilities operated during 1975 without major or costly disruptions.

PRODUCTION

Except for petroleum refining and stone production, most of the activities of the mining industry were modest by European standards. Table 1 shows production statistics of Portugal for 1973, 1974, and 1975.

[1] Physical scientist, International Data and Analysis.

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

Commodity	1973	1974	1975 p
METALS			
Antimony, mine output, metal content	29	30	--
Arsenic, white	362	268	275
Beryl concentrate, gross weight	3	15	25
Columbite-tantalite concentrate, gross weight	12	9	8
Copper:			
Mine output, metal content:			
In cupreous pyrite	5,324	4,595	4,618
In other ore and concentrate	651	568	917
In precipitate	14	16	33
Total	5,989	5,179	5,568
Metal:			
Smelter	r 3,701	3,602	3,992
Refined, primary	2,314	2,519	e 2,540
Gold, mine output, metal content troy ounces	14,661	11,478	2,151
Iron and steel:			
Iron ore and concentrate, gross weight:			
Hematite	11,188	28,498	29,950
Manganiferous	45,550	28,450	21,758
Total	56,738	56,948	51,708
Pig iron thousand tons	347	252	327

See footnotes at end of table.

Table 1.—Portugal: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS—Continued			
Iron and steel—Continued			
Ferroalloys:			
Ferrotungsten	331	369	NA
Other	5,365	11,362	NA
Total	5,696	11,731	9,000
Steel, crude thousand tons	459	376	445
Steel semimanufactures do	408	329	NA
Lead:			
Mine output, metal content	r 507	--	--
Metal, refined	1,000	1,100	1,200
Manganese ore and concentrate, gross weight	187	71	--
Molybdenum ore and concentrate, metal content	2	e 2	e 2
Silver, mine output, metal content troy ounces	125,838	23,888	22,683
Tin:			
Mine output, metal content	r 516	423	555
Metal	r 524	450	409
Titanium, ilmenite concentrate, gross weight	610	274	e 150
Tungsten, mine output, metal content	1,546	1,568	1,748
Uranium oxide (U_3O_8) e	95	95	95
Zinc, mine output, metal content	698	1,600	--
NONMETALS			
Asbestos	e 130	180	e 200
Barite	1,458	1,489	2,121
Cement, hydraulic [1] thousand tons	3,301	3,295	3,881
Clays:			
Kaolin	44,554	49,639	56,998
Other	77,510	121,916	NA
Diatomite	1,153	1,933	2,090
Feldspar	24,018	29,900	13,160
Fertilizer materials, manufactured:			
Nitrogenous, gross weight thousand tons	517	586	NA
Phosphatic, gross weight do	216	216	NA
Mixed and unspecified do	304	273	NA
Total do	1,037	1,075	NA
Gypsum and anhydrite	99,839	143,039	e 160,000
Kyanite and related materials, andalusite	100	50	NA
Lime (quicklime and hydrated lime) thousand tons	r 261	230	e 235
Lithium minerals, lepidolite	1,200	1,200	1,100
Mica, all grades	(2)	--	--
Pyrite and pyrrhotite (including cupreous):			
Gross weight thousand tons	532	511	462
Sulfur content do	234	225	202
Salt:			
Rock do	605	620	297
Marine do	221	223	e 250
Total do	826	843	e 547
Sand and gravel:			
Gravel do	411	328	NA
Sand do	5,256	4,497	
Stone:			
Calcareous:			
Dolomite do	55	84	NA
Limestone, marl, calcite do	6,636	8,125	
Marble do	284	309	
Other:			
Basalt do	39	32	
Diorite do	36	3,387	
Gabbro do	4	1	
Granite do	4,733	4,576	
Graywacke do	29	49	
Ophite do	47	88	
Porphyry do	57	109	
Quartz do	163	141	
Quartzite do	173	181	
Schist do	209	209	
Serpentine do	720	584	
Slate do	77	49	
Syenite do	6	6	
Sulfur, elemental, including sublimed do	280	228	210
Talc	3,147	539	1,570
MINERAL FUELS AND RELATED MATERIALS			
Coal, anthracite thousand tons	221	230	222
Coke, metallurgical do	269	196	160
Fuel briquets, all grades do	34	5	1
Gas, manufactured million cubic feet	15,185	12,996	NA

See footnotes at end of table.

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

Commodity	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels --	4,660	5,969	6,406
Jet fuel ---- do ----	2,017	1,583	2,930
Kerosine ---- do ----	1,097	481	524
Distillate ---- do ----	6,825	7,821	9,164
Residual fuel oil ---- do ----	10,550	15,614	14,441
Lubricants ---- do ----	625	726	473
Other:			
Liquefied petroleum gas ---- do ----	1,131	1,357	1,478
Asphalt ---- do ----	216	1,288	224
Unspecified ---- do ----	2,087	319	2,248
Refinery fuel and loss ---- do ----	2,662	1,369	3,784
Total ---- do ----	31,870	36,527	41,672

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Includes production from the Azores and Madiera Islands as follows in thousand tons: 1973: Azores—20; Madiera—31; 1974: Azores—14; Madiera—31; 1975—NA. The balance of output in each year was from continental Portugal.
[2] Revised to none.

TRADE

The pattern of foreign trade did not change significantly in 1975. The high cost of petroleum caused a continuing deficit in Portugal's minerals trade. The principal minerals exported were petroleum refinery products, pyrites, fertilizers, and stone. West European countries were the principal purchasers. Imports were diversified and included a large variety of commodities (mostly in modest quantities by U.S. standards) from numerous countries. Iron and steel from Japan, the United States, and Western Europe and petroleum from Iraq and Saudi Arabia were the principal imports.

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

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal including alloys, all forms ----	1,210	1,832	Spain 668; Netherlands 613; Angola 155.
Arsenic trioxide, pentoxide, acids ----	211	283	Argentina 166; Italy 50; Greece 17.
Chromium oxide and hydroxide ----	1	5	Mainly to Netherlands.
Columbium and tantalum, tantalum ore and concentrate ----	22	4	All to United States.
Copper:			
Ore ----	20	--	
Copper sulfate ----	205	390	United Kingdom 250; United States 114; Angola 23.
Metal including alloys, all forms ---	2,500	3,075	West Germany 1,277; United Kingdom 450; Angola 381.
Gold:			
Waste and sweepings troy ounces --	--	44	Belgium-Luxembourg 43.
Metal ---- do ----	2,382	1,000	All to Netherlands Antilles.
Iron and steel:			
Ore and concentrate including roasted pyrite:			
Roasted pyrite ----	4	42,997	All to West Germany.
Other ----	46	1	All to Angola.
Metal:			
Scrap ----	50,109	2,501	Netherlands 1,240; Belgium-Luxembourg 305.
Pig iron, ferroalloys, similar materials ----	11,454	10,709	West Germany 5,722; Japan 1,582; Netherlands 1,469.

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

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Iron and steel—Continued			
Semimanufactures:			
Bars, rods, angles, shapes, sections	10,015	3,936	Angola 1,640; Cape Verde Islands 488; Guinea Bissau 421.
Universals, plates, sheets	7,932	5,130	Brazil 3,037; Guinea Bissau 1,210; Angola 657.
Hoop and strip	882	1,357	Angola 991.
Rails and accessories	100	1,741	Thailand 1,700.
Wire	1,788	828	Angola 342; Mozambique 293.
Tubes, pipes, fittings	5,073	5,341	Angola 819; Italy 642; Lebanon 547.
Castings and forgings, rough	1,819	2,295	Sweden 598; United States 433; United Kingdom 171.
Lead:			
Ore and concentrate	1,335	--	
Oxides	54	71	Angola 33; Canada 30; Mozambique 7.
Metal including alloys, all forms	175	164	Angola 142; Mozambique 18.
Magnesium metal including alloys, all forms	7	(1)	Mainly to United Kingdom and Belgium-Luxembourg.
Manganese:			
Ore and concentrate	3,386	3,680	All to Spain.
Oxides	(1)	(1)	All to Mozambique.
Mercury — 76-pound flasks	(2)	(1)	Mainly to Angola.
Molybdenum ore and concentrate	--	4	All to Belgium-Luxembourg.
Nickel metal including alloys, all forms	193	402	Spain 324; Netherlands 37; United Kingdom 30.
Platinum-group metals and silver:			
Waste and sweepings — thousand troy ounces	2,362	--	
Metals including alloys:			
Platinum group — troy ounces	1,905	2,842	West Germany 2,025; France 611; United Kingdom 206.
Silver — do	5,942	466	United States 257; Cape Verde Islands 161; Angola 48.
Tin metal including alloys, all forms	190	115	Netherlands 25; United States 24; Switzerland 16.
Tungsten:			
Ore and concentrate	r 1,809	3,195	United States 1,230; United Kingdom 793; Japan 485.
Metal including alloys, all forms	21	1	Mainly to Switzerland.
Zinc:			
Ore and concentrate	2,150	--	
Oxide	223	2,069	West Germany 850; Netherlands 443; Belgium-Luxembourg 220.
Metal including alloys, all forms	366	236	Belgium-Luxembourg 160; Italy 42; Spain 22.
Other:			
Ore and concentrate:			
Of titanium, vanadium, zirconium	618	500	All to Italy.
Of base metals, n.e.s	49	152	West Germany 133; Brazil 10; United States 9.
Ash and residue containing nonferrous metals	393	754	Belgium-Luxembourg 501; West Germany 114; Japan 68.
Oxides, hydroxides, peroxides of metals, n.e.s	1	(1)	Mainly to Angola.
Base metals, including alloys, all forms, n.e.s	25	21	United Kingdom 20; Belgium-Luxembourg 1.
NONMETALS			
Abrasives natural, n.e.s.:			
Pumice, emery, natural corundum, etc	29	23	Angola 11; United Kingdom 10.
Grinding and polishing wheels and stones	166	139	Angola 48; United States 30; Mozambique 14.
Asbestos	2	(1)	Mainly to Angola.
Barite and witherite	21	26	All to Angola.
Cement	89,834	66,610	Israel 29,630; Cape Verde Islands 17,583; Gibraltar 6,700.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Chalk	144	119	Angola 81; Mozambique 30.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Kaolin	266	535	Morocco 400; Angola 110; Italy 20.
Other	1,465	994	Spain 831; Angola 66.
Products:			
Refractory (including nonclays bricks)	747	985	Angola 855; Guinea 58; Belgium-Luxembourg 37.
Nonrefractory	28,782	19,345	Spain 6,935; Cape Verde Islands 3,607; Mozambique 1,878.
Diamond:			
Gem, not set or strung thousand carats	r 1,492	1,439	United Kingdom 1,410; Belgium-Luxembourg 29.
Industrial do	662	563	All to United Kingdom.
Diatomite and other infusorial earth	77	64	Venezuela 20; Mozambique 20; Angola 11.
Feldspar, leucite, nepheline, etc	9,140	7,800	Italy 4,000; France 2,290; United Kingdom 1,340.
Fertilizer materials, natural, manufactured:			
Nitrogenous	90,401	190,479	Brazil 137,705; Republic of South Africa 23,977; West Germany 23,400.
Phosphatic	51,239	71,485	Brazil 37,500; Salvador 19,425; Guatemala 3,150.
Potassic	1,706	442	Angola 398; United States 34.
Other including mixed	34,516	4,022	Angola 3,600; West Germany 396.
Ammonia	56,378	49,449	United Kingdom 13,809; Greece 12,458; Spain 9,015.
Graphite, natural	9	6	Angola 4; Mozambique 2.
Gypsum and plasters	260	125	Angola 62; Mozambique 43; Cape Verde Islands 9.
Lime	941	620	Mozambique 444; Cape Verde Islands 81; United States 81.
Magnesite	(1)	(1)	Mainly to Cape Verde Islands.
Mica, all forms	(1)	--	
Pigments, mineral:			
Natural, crude	70	86	Angola 30; Republic of South Africa 30; Mozambique 17.
Iron oxides, processed	52	67	Spain 24; Angola 12; Norway 10.
Pyrite (gross weight)	76,340	94,426	All to Belgium-Luxembourg.
Salt	359	466	Finland 310; Angola 101; Guinea 21.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	1,288	4,404	Spain 2,273; Angola 1,740; Mozambique 199.
Caustic potash, sodic, potassic peroxides	11	4	Cape Verde Islands 3.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Marble and other calcareous	138,564	132,510	Italy 43,733; Spain 31,420; Belgium-Luxembourg 20,988.
Slate	9,828	8,141	Belgium-Luxembourg 2,359; West Germany 1,441; Denmark 1,342.
Granite and other	10,496	17,605	Italy 13,978; Japan 1,984; Spain 875.
Worked:			
Slate	6,095	8,014	Belgium-Luxembourg 2,681; Netherlands 2,624; United States 709.
Paving and flagstone	147,560	133,036	West Germany 78,379; United Kingdom 16,979; Denmark 14,478.
Marble and other	20,664	23,277	West Germany 11,126; France 3,237; United Kingdom 2,212.
Dolomite, chiefly refractory grade	4	--	
Gravel and crushed rock	12,855	12,277	Gibraltar 9,507; Italy 1,900; Netherlands 400.
Limestone (except dimension)	242	95	United States 59; Cape Verde Islands 9; Guinea 8.
Quartz and quartzite	134,809	97,553	Norway 74,150; Italy 17,480; Sweden 3,002.
Sand excluding metal bearing	47,031	64,123	Italy 32,420; Gibraltar 24,790; Morocco 3,410.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Sulfur:			
Elemental, all forms	r 50	4	Angola 3.
Sulfuric acid	41,790	27,806	Brazil 19,767; Turkey 4,830; Spain 2,080.
Talc, steatite, soapstone, pyrophyllite	r 179	71	Angola 61; Mozambique 9.
Other nonmetals, n.e.s.:			
Slag, dross and similar waste, not metal bearing from iron and steel manufacture	6	10	All to West Germany.
Oxides and hydroxides of magnesium, strontium and barium	5	--	
Bromine, iodine, fluorine	1	1	Mainly to Angola.
Building materials of asphalt, asbestos, fiber cement, unfired nonmetals, n.e.s	4,274	2,475	Cape Verde Islands 1,343; West Germany 328; Sweden 117.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,896	874	Guinea 818; Cape Verde Islands 51.
Carbon black	7	8	Angola 7; Mozambique 1.
Coal, all grades including briquets	162	99	Cape Verde Islands 27; Angola 25; Spain 23.
Coke and semicoke	15,654	15,079	Netherlands 15,027; Angola 52.
Hydrogen and rare gases	(1)	(1)	Mainly to Guinea and Angola.
Petroleum refinery products:			
Bunker deliveries:			
Gasoline, aviation thousand 42-gallon barrels	9	6	Foreign flag vessels and aircraft.
Kerosine do	(1)	(1)	Do.
Jet fuel do	721	1,126	Do.
Distillate fuel oil do	166	364	Do.
Residual fuel oil do	472	339	Do.
Lubricants do	18	33	Do.
Total do	1,386	1,868	
Non-Bunker deliveries:			
Gasoline:			
Aviation do	44	44	Guinea 30; Guinea Bissau. 6
Motor do	85	230	West Germany 155; Guinea 50; Cape Verde Islands 9.
Kerosine do	743	56	Cape Verde Islands 23; Angola 16.
Jet fuel do	4	4	Netherlands 1; Brazil 1; United States 1.
Distillate fuel oil do	358	815	Angola 380; France 134; Belgium-Luxembourg 125.
Residual fuel oil do	--	772	United States 406; Sweden 224; Norway 129.
Lubricants do	321	209	United Kingdom 86; Spain 56; Sweden 14.
Other:			
Liquefied petroleum gas do	19	14	Cape Verde Islands 6; Guinea 5; Guinea Bissau 2.
Mineral jelly and wax do	20	33	West Germany 13; Spain 11.
Unspecified do	2	6	Spain 4; Angola 1.
Grand total do	2,982	4,051	

r Revised.
1 Less than ½ unit.
2 Value only reported at $1,337.

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

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	617	20	All from Netherlands.
Metal including alloys, all forms:			
Scrap	115	640	Canada 284; Norway 146; Spain 111.
Unwrought	4,295	6,619	Norway 1,878; Spain 1,823; France 935.
Semimanufactures	18,127	26,154	Canada 6,142; Belgium-Luxembourg 4,331; Switzerland 2,460.

Table 3.—Portugal: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Beryllium:			
Beryl ore and concentrate	311	27,772	Brazil 23,617; Spain 3,821.
Metal including alloys, all forms	--	(1)	Mainly from France.
Chromium:			
Chromite	327	556	Republic of South Africa 202; Netherlands 158.
Oxide and hydroxide	280	215	West Germany 181; Spain 19.
Cobalt oxide and hydroxide	57	13	Belgium-Luxembourg 7; West Germany 3; United States 2.
Copper:			
Ore	--	5	All from Netherlands.
Copper sulfate solution	885	1,031	United Kingdom 879; France 143.
Metal including alloys:			
Scrap	394	337	Spain 100; Guinea 53; Guinea Bissau 27.
Unwrought:			
Blister	1,599	1,520	Angola 750; Zambia 675; Belgium-Luxembourg 75.
Refined, unalloyed	6,334	6,851	Canada 3,159; Belgium-Luxembourg 2,594; United Kingdom 999.
Other	2,114	1,433	United Kingdom 792; Denmark 373; West Germany 226.
Semimanufactures	8,931	13,414	United Kingdom 3,286; France 2,540; West Germany 2,086.
Gold metal, unworked or partly worked troy ounces	1,129	4,598	West Germany 1,926; Belgium-Luxembourg 1,520; Switzerland 1,003.
Iron and steel:			
Ore and concentrate	491,717	[2] 417,841	Angola 192,000; Republic of South Africa 92,092; Brazil 90,744.
Metal:			
Scrap	6,288	8,113	Lebanon 835; United Kingdom 621.
Pig iron, ferroalloys, similar materials	39,832	45,060	Spain 32,933; Canada 2,940; Belgium-Luxembourg 1,990.
Steel, primary forms	191,339	274,656	United States 70,091; West Germany 34,028; Spain 32,149.
Semimanufactures:			
Bars, rods, angles, shapes, sections	99,832	173,804	Belgium-Luxembourg 58,692; West Germany 39,400; Netherlands 17,403.
Universals, plates, sheets	187,267	249,874	West Germany 76,674; France 49,355; Belgium-Luxembourg 42,692.
Hoop and strip	29,076	53,240	Belgium-Luxembourg 29,831; West Germany 16,023.
Rails and accessories	15,620	32,025	Belgium-Luxembourg 20,014; France 10,134.
Wire	11,150	18,272	West Germany 4,848; Belgium-Luxembourg 3,362; United Kingdom 3,085.
Tubes, pipes, fittings	23,664	31,412	West Germany 16,758; France 4,524.
Castings and forgings, rough	767	908	West Germany 340; France 219.
Lead:			
Oxides	77	302	West Germany 212; United Kingdom 64; United States 19.
Metal including alloys:			
Scrap	309	263	Malta 100; United Kingdom 63; Gibraltar 60.
Unwrought	10,074	14,086	Mexico 6,226; United Kingdom 4,055; Australia 1,807.
Semimanufactures	234	359	West Germany 157; United Kingdom 48; France 44.
Magnesium metal including alloys, all forms	9	9	United Kingdom 6; France 1.
Manganese:			
Ore and concentrate	123	508	Spain 505.
Metal including alloys, all forms	444	538	United Kingdom 266; Spain 77; Belgium-Luxembourg 76.
Mercury 76-pound flasks	319	580	Yugoslavia 299; Spain 223; United States 52.

See footnotes at end of table.

'ortugal: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Molybdenum:			
Ore and concentrate -- kilograms --	--	20,000	All from Finland.
Metal including alloys, all forms do ----	1,600	1,900	Spain 500; Netherlands 500; United Kingdom 400.
Nickel metal including alloys:			
Scrap	100	47	Canada 32; Norway 6.
Unwrought	65	80	Finland 30; United Kingdom 20; Norway 11.
Semimanufactures	465	560	United Kingdom 235; West Germany 180; Finland 64.
Platinum-group metals and silver:			
Waste and sweepings troy ounces --	--	64	All from Saudi Arabia.
Metals including alloys:			
Platinum group do ----	3,526	5,541	France 2,559; West Germany 1,504; United Kingdom 1,433.
Silver - thousand troy ounces --	1,812	1,407	United Kingdom 633; West Germany 524; Switzerland 158.
Rare-earth metals:			
Oxides	10	12	Spain 4; West Germany 3; United Kingdom 2.
Metals including alloys kilograms --	200	11,000	France 6,700; United Kingdom 4,300.
Tin:			
Oxides	13	14	West Germany 11; United Kingdom 2.
Metal including alloys:			
Scrap	--	(1)	Mainly from United Kingdom.
Unwrought	318	481	United Kingdom 221; Belgium-Luxembourg 120; Malaysia 120.
Semimanufactures	47	60	West Germany 13; Netherlands 11; Japan 8.
Titanium:			
Ore and concentrate, rutile	268	259	All from Australia.
Oxides	6,014	5,531	United Kingdom 1,714; West Germany 1,495; Finland 877.
Tungsten metal including alloys, all forms	6	(1)	All from United States and West Germany.
Zinc:			
Ore and concentrate	4	10	All from United Kingdom.
Oxide	296	342	United Kingdom 135; West Germany 95; Italy 33.
Metal including alloys:			
Scrap	131	145	Belgium-Luxembourg 52; France 50; West Germany 16.
Blue powder	148	151	Norway 83; United Kingdom 37; West Germany 30.
Unwrought	11,488	11,463	Belgium-Luxembourg 5,212; Netherlands 1,310; United Kingdom 1,033.
Semimanufactures	1,094	1,385	West Germany 762; United Kingdom 264; Belgium-Luxembourg 244.
Other:			
Ore and concentrate:			
Of titanium, vanadium, zirconium	474	1,069	Australia 621; United Kingdom 286; Spain 81.
Of base metals, n.e.s	742	176	United Kingdom 125; Australia 50.
Oxides, hydroxides and peroxides of metals, n.e.s	1,961	2,320	United Kingdom 1,783; Spain 280; West Germany 117.
Metals including alloys, all forms:			
Metalloids	67	413	Spain 288; Sweden 52; United Kingdom 43.
Alkali, alkaline earth, rare-earth metals --------- kilograms --	200	12,400	West Germany 12,200.
Pyrophoric alloys	4	4	Austria 3; United Kingdom 1.
Base metals including alloys, all forms, n.e.s	95	113	People's Republic of China 28; United Kingdom 26; Belgium-Luxembourg 16.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS			
Abrasives:			
Natural, n.e.s.:			
Pumice, emery, natural corundum, etc	475	530	Italy 220; Netherlands 186; Greece 52.
Dust and powder of precious and semiprecious stones (including diamond) kilograms	113	30	United Kingdom 20; Denmark 4; United States 4.
Grinding and polishing wheels and stones	518	569	United Kingdom 160; West Germany 103; Italy 97.
Artificial corundum	651	935	West Germany 357; France 250; Spain 168.
Asbestos	8,701	9,653	Canada 3,950; Republic of South Africa 2,103; West Germany 962.
Barite and witherite	840	1,702	United States 926; Netherlands 632; West Germany 68.
Boron materials:			
Crude natural borates	817	1,358	United Kingdom 1,100; France 213; Spain 205.
Oxide and acid	187	259	France 115; Netherlands 62; Turkey 35.
Cement	46,827	12,063	Sweden 9,162; France 1,891; United States 659.
Chalk	6,658	6,344	France 3,034; Spain 1,522; Belgium-Luxembourg 905.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s:			
Bentonite	7,194	9,548	Spain 4,827; United States 1,481; Algeria 1,333.
Kaolin	5,827	7,406	United Kingdom 5,701; France 1,280.
Other	3,560	7,518	United Kingdom 2,259; Spain 1,305; Mozambique 575.
Products:			
Refractory (including nonclay bricks)	7,269	9,154	West Germany 2,711; Italy 1,915; France 986.
Nonrefractory	3,678	6,774	Spain 4,280; Italy 2,143.
Cryolite and chiolite	73	80	Denmark 68; Spain 12.
Diamond, except powder and dust:			
Gem, not set or strung thousand carats	7	6	Belgium-Luxembourg 5.
Industrial do	11	2	Mainly from Belgium-Luxembourg.
Unclassified do	1,942	2,186	All from Angola.
Diatomite and other infusorial earth	3,272	3,847	Spain 1,658; United States 959; West Germany 517.
Feldspar, leucite, nepheline, etc	1,521	1,543	United Kingdom 1,100; France 213; Spain 205.
Fertilizer materials:			
Crude:			
Nitrogenous	1,420	1,537	Chile 1,500.
Phosphatic	298,354	308,100	Morocco 307,704.
Manufactured:			
Nitrogenous	13,515	3,753	Netherlands 1,440; Belgium-Luxembourg 1,125.
Phosphatic	8,276	8,826	Belgium-Luxembourg 6,729; France 1,998.
Potassic	41,916	53,247	Spain 53,094.
Other including mixed	45,856	9,293	Belgium-Luxembourg 2,643; Spain 2,594; United Kingdom 2,102.
Graphite, natural	322	286	United Kingdom 207; Italy 35; West Germany 22.
Gypsum and plasters	33,549	24,411	Morocco 22,682; France 915; Spain 748.
Iodine	6	5	Japan 4.
Lime, hydraulic	(1)	16	France 10; West Germany 6.
Magnesite	472	618	Italy 286; Netherlands 176; Austria 73.
Mica:			
Crude including splittings and waste	391	294	Norway 196; United Kingdom 72; Republic of South Africa 10.
Worked including agglomerated splittings	10	16	Sweden 7; Belgium-Luxembourg 3; Spain 2.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Pigment, mineral:			
Natural, crude	61	56	Spain 46; France 6.
Iron oxides, processed	1,789	2,101	West Germany 852; Spain 707; United Kingdom 241.
Salt and brine	53,469	48,326	Italy 31,585; Netherlands 11,815; Cape Verde Islands 2,940.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	31	82	United States 27; Italy 20; Sweden 13.
Caustic potash, sodic and potassic peroxides	455	204	France 104; Italy 37; West Germany 31.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	2,238	2,562	Angola 2,524.
Worked	188	231	Spain 156; Italy 58; Belgium-Luxembourg 13.
Dolomite, chiefly refractory grade	5,512	4,443	Italy 3,251; Norway 772; Spain 351.
Gravel and crushed rock	334	136	Denmark 72; France 30; Italy 17.
Quartz and quartzite	149	288	Sweden 129; West Germany 78; Belgium-Luxembourg 77.
Sand excluding metal bearing	7,201	9,332	Belgium-Luxembourg 5,896; Spain 2,788; France 323.
Sulfur:			
Elemental:			
Other than colloidal	23,262	30,078	France 28,349; Spain 1,470.
Colloidal	265	169	France 90; West Germany 72.
Sulfur dioxide	253	289	West Germany 149; Netherlands 64; Spain 49.
Sulfuric acid	21,073	28,472	West Germany 13,946; United Kingdom 7,509; Poland 4,343.
Talc, steatite, soapstone, pyrophyllite	3,981	3,399	France 1,694; Norway 530; Austria 376.
Other nonmetals, n.e.s:			
Crude:			
Meerschaum, amber, jet	1	(1)	All from West Germany and United States.
Other	9,922	8,718	Cape Verde Islands 6,074; Republic of South Africa 323; Norway 296.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	4,259	31,086	All from France.
Slag and ash, n.e.s	1	2	West Germany 1; Sweden 1.
Oxides and hydroxides of magnesium, strontium, barium	1,300	2,111	United Kingdom 1,018; Netherlands 956.
Bromine and other halogens (excluding iodine)	11	--	
Building materials of asphalt, asbestos, and fiber cement and unfired nonmetals, n.e.s	403	1,776	Spain 587; West Germany 239.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,147	1,278	Spain 596; Netherlands 320; Cape Verde Islands 91.
Carbon black and gas carbon:			
Carbon black	9,017	8,777	Spain 3,000; United Kingdom 2,506; France 1,848.
Gas carbon	32	30	Mainly from West Germany.
Coal, all grades including briquets thousand tons	432	297	United States 245; Poland 45.
Coke and semicoke do	38	51	United Kingdom 17; Spain 12; West Germany 2.
Hydrogen and rare gases do	20	13	Spain 7; Netherlands 3; West Germany 2.
Peat, including peat briquets and litter do	842	865	West Germany 296; United States 194; Finland 131.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	31,677	41,738	Angola 13,984; Iran 13,818; Iraq 12,671.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline:			
Aviation thousand 42-gallon barrels	97	220	Italy 163; Netherlands 37.
Motor do	953	1,363	Spain 672; Italy 215; Netherlands 168.
Total do	1,050	1,583	
Kerosine and jet fuel do	472	857	Netherlands 312; Italy 226; Spain 106.
Distillate fuel oil do	1,552	1,551	Netherlands 970; Italy 392; Saudi Arabia 156.
Residual fuel oil do	1,679	2,330	Mozambique 821; Italy 530; Bahrain 319.
Lubricants do	r 123	150	Netherlands 52; United Kingdom 35; Belgium-Luxembourg 25.
Other:			
Liquefied petroleum gas do	3,114	2,948	France 1,347; United Kingdom 535; Italy 264.
Mineral jelly and wax do	38	26	West Germany 16; United Kingdom 2; Romania 1.
White spirit do	26	18	France 7; Belgium-Luxembourg 5; Netherlands 4.
Unspecified do	351	419	France 95; Spain 85; Netherlands 84.
Grand total do	8,405	9,882	
Mineral tar and other coal,- petroleum-, or gas-derived crude chemicals	14,862	10,604	Netherlands 5,651; United Kingdom 2,709; Spain 903.

r Revised.
[1] Less than ½ unit.
[2] Includes pyrite.

COMMODITY REVIEW

METALS

During 1975, there was little change in the variety of metal-bearing minerals and metals produced in Portugal. Tungsten, iron and steel, copper, tin, and gold remained the principal metals produced in the country.

Iron and Steel.—There were one iron ore and one manganese mine in operation in Portugal during 1975; Siderurgia Nacional S.A.R.L., with a plant at Seixal, was the major iron and steel producer in the country.

Tungsten.—Tungsten ores remained the most significant mineral produced in Portugal. Most of the tungsten mines were situated in the northern and central northern part of the country. There were nine tungsten mines, the largest of which was Panasqueira, situated about 300 miles northeast of Lisbon, near the locality of Fundão, operated by Beralt Tin & Wolfram Ltd.

NONMETALS

Construction materials, mostly cement and ornamental stone, feldspar, clays, salt, and manufactured fertilizers were produced in the country during 1975. Nonmetals production was significant only to Portugal.

Cement.—Five cement plants with 16 kilns (total annual kiln capacity, 3.5 million tons) were in operation in Portugal during 1975. Compania Cimento Tejo S.A.R.L. and Compania Geral de Coil e Cimento S.A.R.L. (SECIL), both headquartered in Lisbon, were the two largest producers, accounting for about 50% of the total cement output.

Fertilizer Materials.—Amoniaco Português will have a 51% interest in two companies that will operate facilities based on a 1,500-ton-per-day ammonia plant. The new fertilizer project will be located at Sines, south of Lisbon, and was scheduled for production in 1980.

Stone.—Approximately 390 producers of stone operated various stone quarries in the country. Ornamental stone (marble and granite) remained the most important activity and large quantities were exported to Italy for further processing. The area around Vila Viçosa-Borba-Estremoz was the major producing region, accounting for about 70% of the total output.

MINERAL FUELS

During 1975, imported petroleum and refinery products remained the principal sources of energy in the country. In addition, high-rank coal and coke had to be imported to meet the demand. Coal, mostly anthracite, remained the principal source of energy produced domestically. Table 4 shows supply and apparent consumption of energy for 1973 and 1974.

Coal.—The only mineral fuel produced in Portugal remained coal—anthracite. During 1975 the only anthracite mine in production was located near Oporto in the northern part of Portugal.

Natural Gas and Petroleum.—There was no production of natural gas and petroleum in Portugal. Consequently imported liquefied natural gas and crude oil were processed in domestic plants and refineries. During 1975, two petroleum refineries at Lisbon and Oporto were in operation with an annual capacity of 9.5 million tons of crude per year. Expansion was completed on the largest refinery, the SACOR Refinery, located at Oporto. Annual capacity was increased from 3.5 million tons to 7.5 million tons of crude oil. Crude oil storage capacity was increased to about 805,000 cubic meters. Construction continued on the Sines Petroleum Refinery, located 60 miles south of Lisbon. Sociedade Portegesa de Refinação de Petroleo (Petrosol) is expected to operate the new refinery, which is rated at 6 million tons of crude per year. However, if a projected merger of the three petroleum companies (Petrosol, Sines, and SACOR) becomes reality, a new Government-owned company, Petrogal, would operate the refinery.

Table 4.—Supply and apparent consumption of energy for 1973 and 1974 [1]
(Million tons of standard coal equivalent) [2]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Peat, fuelwood and other fuels	Hydroelectric power
1973:						
Production	1.1	0.2	--	--	--	0.9
Imports	5.4	.5	4.5	(3)	0.3	.1
Exports	.6	(3)	(3)	(3)	--	.6
Apparent consumption	5.9	.7	4.5	(3)	.3	.4
1974:						
Production	1.2	.2	--	--	--	1.0
Imports	5.2	.4	4.4	(3)	.3	.1
Exports	.7	--	--	(3)	--	.7
Apparent consumption	5.7	.6	4.4	(3)	.3	.4

[1] Includes nonenergy uses.
[2] 1 ton standard coal equivalent (SEC) =7,000,000 kilocalories.
[3] Less than 0.1 million tons of standard coal equivalent.

The Mineral Industry of Romania

By Nikita Wells [1]

The Romanian economy continued to expand at a relatively high rate despite difficulties caused in 1975 by the world economic slowdown and raw materials price increases. According to Romanian sources, the 1971–75 industrial production plan was fulfilled, but many of the goals in the 1975 annual plan were not reached. National income increased 9.8% instead of the 14.0% called for in the 1975 plan. Labor productivity in industry increased 7.1% over that of 1974, compared with a planned 10.3%. Foreign trade also lagged far behind the plan, increasing 6.6% compared with the planned 21.8%. Overall industrial production increased 12.4% over that of 1974. The metal processing, machine building, and chemical industries were developed on a top priority basis in 1975 and represented 54.8% of the overall industrial output.

Romania carried out an extensive geological prospecting program during the last 5-year plan in order to discover and delineate new reserves of minerals needed for expansion of its raw materials and energy base. The extraction of raw materials was considerably more intense in 1975 compared with 1970. Production of copper ores increased 73.9%; complex ores, 31.7%; bauxite, 13.4%; and salt 33.9% during this period. New methods were introduced in crude oil drilling and extraction. Mining of lignite was expanded and increased 36.4%. In ferrous metallurgy, production increased by 70% during the last 5-year plan. The output of finished rolled products increased 51%; that of medium and light rolled products, 34%; heavy and medium plate, 160%; steel sheet, 130%; and steel pipe, 50%. Additional installed capacity of electric powerplants during this period totaled 4.3 million kilowatts. Romania's total electric generating capacity had reached 11.5 million kilowatts in 1975.[2]

Government Policies and Programs.—The Romanian Grand National Assembly adopted the 5-year plan for 1976–80 in July 1976.[3] By yearend 1980, the plan calls for an annual production of 75 billion to 78.8 billion kilowatt-hours of electric power, 53 million to 56.6 million tons of coal, 15.5 million tons of crude oil, 26.8 billion cubic meters of natural gas, 16.6 million to 17.3 million tons of crude steel, 255,000 to 260,000 tons of aluminum and aluminum alloys, and 19 million to 20 million tons of cement.

According to the 1976–80 plan, the average annual growth rate of industrial production is to range between 10.2% and 11.2%. Ferrous and nonferrous metallurgical production is to increase 73% to 81% in 1980 as compared with 1975. The output of fuels in 1980 is to increase 38% to 45%, while chemical output is to increase 103% to 115% over that of 1975. The average annual growth rate of foreign trade is to be between 13.7% and 15%. The total volume of investments in the national economy in the period 1976–80 is to amount to 1 trillion lei,[4] of which 580.5 billion lei is to be allocated to the industrial branch.

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[1] Physical scientist, International Data and Analysis.
[2] Scînteia (Bucharest). Feb. 4, 1976, pp. 2–4.
[3] Scînteia (Bucharest). July 3, 1976, pp. 2–3.
[4] Values have not been converted from Romanian currency units (lei) to U.S. dollars because of the wide variation between the official exchange rate and the rate actually used for some transactions. The exchange rate for 1975 was 4.97 lei=US$1.00 (official), and 12.00 lei=US$1.00 (tourist rate).

PRODUCTION

In 1975, Romania's iron and steel industry continued to expand and nearly met the goals of the last 5-year plan. Crude steel production, in 1975 increased 8.0%, pig iron, 8.6%, and steel rolled products, 8.9% as compared with 1974. New production capacities were commissioned at many steel plants during 1975. In the nonferrous metals sector, primary aluminum production increased 9.1% owing to a higher output from the aluminum plant at Slatina. Copper ore production increased and new deposits were discovered in the Moldova Nouă and Raşia Poieni areas.

In the nonmetals sector, mineral fertilizers showed a rapid growth with an increase of 23% over that of 1974. Cement production increased only 2.9% and fell considerably short of its plan. Except for natural gas, which showed a 9.4% increase, the production of domestic minerals fuels showed a small increase in 1975 as compared with 1974. Romania's electric power generating capacity increased 8.5% in 1975 over that of 1974.

Romania does not report production statistics on many of its mineral commodities, and therefore much of the data presented in table 1 were estimated.

Table 1.—Romania: Production of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum:			
Bauxite, gross weight [e]	[r] 600,000	700,000	800,000
Alumina, gross weight [e]	282,000	374,000	400,000
Ingot (including alloys)	141,241	187,000	204,000
Bismuth, mine output, metal content [e]	80	80	80
Cadmium, smelter output [e]	80	90	88
Copper: [e]			
Mine output, metal content, recoverable	[r] 31,000	34,000	37,000
Smelter	[r] 31,000	34,000	37,000
Refined	[r] 31,000	34,000	37,000
Gold, mine output, metal content [e] troy ounces	60,000	60,000	60,000
Iron and steel			
Iron ore thousand tons	3,234	3,265	3,065
Pig iron and blast furnace ferroalloys do	5,713	6,081	6,602
Crude steel do	8,161	8,848	9,549
Semimanufactures:			
Castings and forgings, finished do	669	767	898
Pipes and tubes do	902	973	1,151
Rolled products do	5,833	6,253	6,810
Lead: [e]			
Mine output, metal content, recoverable	41,000	41,000	41,000
Smelter	39,000	39,000	39,000
Manganese ore: [e]			
Gross weight	140,000	140,000	140,000
Manganese content	34,000	34,000	34,000
Silver, mine output, metal content [e] thousand troy ounces	1,100	1,100	1,500
Zinc: [e]			
Mine output, metal content, recoverable	[r] 49,000	[r] 51,000	53,000
Smelter	[r] 49,000	[r] 51,000	53,000
NONMETALS			
Barite [e]	116,000	116,000	116,000
Cement, hydraulic thousand tons	9,848	11,195	11,520
Chalk [e] do	NA	225	NA
Clays: [e]			
Bentonite	50,000	62,800	62,800
Kaolin	50,000	87,400	87,400
Refractory	NA	492,500	NA
Diatomite [e]	NA	40,000	NA
Feldspar	[e] 50,000	58,200	58,000
Fertilizer materials, manufactured:			
Nitrogenous, N content thousand tons	854	980	1,292
Phosphatic, P_2O_5 content do	361	404	404
Fluorspar [e]	15,000	15,000	15,000
Graphite [e]	6,000	6,000	6,000
Lime thousand tons	[r] 2,627	3,071	3,064
Pyrite: [e]			
Gross weight do	870	870	870
Sulfur content do	375	375	375

See footnotes at end of table.

Table 1.—Romania: Production of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
NONMETALS—Continued			
Salt thousand tons	3,296	3,923	3,833
Sand [e]	NA	1,130	1,200
Sodium carbonate, manufactured, 100% Na_2CO_3 basis thousand tons	677	807	693
Sulfuric acid (monohydrate) do	1,311	1,358	1,448
Talc [e]	60,000	60,000	60,000
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	77,367	78,384	86,447
Coal:			
Run-of-mine:			
Anthracite and bituminous thousand tons	8,294	8,523	8,809
Brown do	654	683	660
Lignite do	17,716	20,001	19,916
Total do	26,664	29,207	29,385
Washed (produced from above):			
For coke and semicoke production do	1,344	1,525	1,845
Lignite do	17,057	19,141	19,155
Other (unspecified) do	6,450	6,232	6,091
Total do	24,851	26,898	27,091
Briquets produced from brown coal do	169	312	236
Coke, metallurgical do	1,321	1,851	2,277
Gas:			
Manufactured (coke oven) million cubic feet	18,434	33,443	[e] 33,600
Natural:			
Gross production:			
Associated do	[r] 208,603	219,762	222,658
Nonassociated do	834,799	855,211	953,527
Total do	[r] 1,043,402	1,074,973	1,176,185
Marketed production do	[r] 980,083	1,011,513	953,527
Petroleum:			
Crude:			
As reported thousand tons	14,287	14,486	14,590
Converted [e] thousand 42-gallon barrels	106,481	107,964	108,739
Refinery products: [2]			
Gasoline do	[r] 28,569	29,325	34,408
Jet fuel and kerosine do	7,936	7,587	7,890
Distillate fuel oil do	41,754	40,523	41,112
Residual fuel oil do	36,170	40,320	39,887
Lubricants do	4,536	4,571	4,200
Other:			
Liquefied petroleum gas do	2,865	2,819	2,912
Asphalt do	3,660	3,539	3,697
Total do	[r] 125,490	128,684	134,106

[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 1975 the total volume of foreign trade turnover (exports plus imports) reached 53.1 billion lei, demonstrating an average annual growth rate during the 1971–75 plan of 18.4%. However, the total turnover in 1975 showed only a 6.6% increase over that of 1974, while the plan called for a 21.8% increase, requiring the total volume to reach 60.6 billion lei. The total values of Romanian exports and imports were balanced in 1975, each totaling about 26.5 billion lei.[5]

In 1975, Romania's most important imports consisted of raw materials including crude oil, coking coal and coke, iron ore, bauxite, apatite, and copper. Romanian exports consisted mainly of petroleum products and other processed raw materials. In 1974 and 1975, trade by major commodity groups was as follows:[6]

[5] Revista Economica (Bucharest). No. 13, Apr. 2, 1976, pp. 13–16.

[6] Anuarul Statistic al Republicii Socialiste România 1976 (Annual Statistics of the Socialist Republic of Romania 1976). Bucharest, 1976, pp. 384–387.

	Value (million lei)		Percent of total	
	1974	1975	1974	1975
Exports:				
Building materials	723.2	772.0	3.0	2.9
Chemicals, fertilizers, rubber	2,714.5	2,857.0	11.2	10.8
Fuels, minerals, metals	5,308.0	5,911.9	21.9	22.3
Imports:				
Building materials	237.5	296.4	1.0	1.1
Chemicals, fertilizers, rubber	2,586.7	1,721.1	10.1	6.5
Fuels, minerals, metals	8,209.5	10,153.2	32.1	38.2

Romania's principal trading partners in 1974 and 1975 were as follows:

	Total trade (million lei)		Percent of total	
	1974	1975	1974	1975
U.S.S.R	7,842	9,858	15.8	18.6
Germany, West	6,271	5,039	12.6	9.5
Germany, East	2,850	2,909	5.7	5.5
United Kingdom	2,646	1,503	5.3	2.8
Czechoslovakia	2,231	2,447	4.5	4.6
Italy	2,157	2,273	4.3	4.3
Switzerland	1,832	2,068	3.7	3.9
Poland	1,828	2,073	3.7	3.9
People's Republic of China	1,738	2,164	3.5	4.1

The proportion of Romania's trade with centrally planned economy countries was 41.2% in 1974 and 44% in 1975, while developing market economy countries accounted for 13% in 1974 and 19% in 1975.[7]

In August 1975 the United States granted Romania "most favored nation" status for trade agreements, creating favorable conditions for trade between the two countries.

[7] Romanian Foreign Trade (Bucharest). No. 3, 1976, pp. 5–10.

Table 2.—Romania: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal destinations, 1974
METALS			
Aluminum metal including alloys:			
Scrap	r 3,339	2,201	West Germany 863; Sweden 695; Italy 643.
Unwrought and semimanufactures	[3] 49,000	47,342	Japan 14,440; France 14,117; West Germany 6,417.
Chromium oxide and hydroxide	--	60	Japan 50; France 10.
Copper metal including alloys, all forms	[3] 2,500	3,857	West Germany 3,784.
Iron and steel:			
Roasted pyrite	NA	11,190	All to Austria.
Scrap	4,072	2,660	All to Italy.
Pig iron and ferroalloys	24,120	36,448	Mainly to Japan.
Steel, primary forms	8,674	16,635	All to Poland.
Semimanufactures: [4]			
Bars, rods, angles, shapes, sections	287,000	230,000	NA.
Plates and sheets	r 759,000	664,000	NA.
Hoop and strip	43,000	103,000	NA.
Wire	r 56,000	59,000	NA.
Pipes, tubes, fittings	r 240,000	235,000	U.S.S.R. 145,000.
Total	r 1,385,000	1,291,000	
Lead metal including alloys, all forms	200	281	Italy 99; West Germany 93; Austria 89.
Magnesium metal including alloys, all forms	--	72	All to France.
Manganese ore	[3] 20,800	44,372	All to Japan.
Nickel scrap	46	75	All to Sweden.
Silver: Waste and sweepings value, thousands	$116	$54	All to Italy.
Zinc metal including alloys, all forms	3,200	3,099	Switzerland 2,017; Belgium-Luxembourg 598.

See footnotes at end of table.

Table 2.—Romania: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [2]	Principal destinations, 1974
NONMETALS			
Other:			
Nonferrous, scrap, n.e.s	24	194	West Germany 106; Italy 88.
Base metals, n.e.s	NA	5	France 3; Belgium-Luxembourg 2.
Barite	[3] 27,800	6,391	All to U.S.S.R.
Cement, hydraulic ....thousand tons	[3] 1,786	905	Yugoslavia 396; Israel 150; Czechoslovakia 136.
Clays and clay products:			
Crude, bleaching	1,685	NA	
Products:			
Refractory	([5])	104	All to Italy.
Nonrefractory	89,261	91,561	Yugoslavia 89,458.
Diamond, industrial ....value, thousands	$140	$251	Mainly to Belgium-Luxembourg.
Fertilizer materials, manufactured:			
Nitrogenous	271,312	86,444	West Germany 62,675; Sweden 19,919.
Phosphatic	3,613	1,615	All to West Germany.
Mixed	17,040	1,817	Spain 1,000; West Germany 817.
Gypsum, calcined	NA	27,971	All to Hungary.
Lime, calcined	NA	29,430	Do.
Pigments, mineral, natural	337	491	Denmark 250; Italy 205.
Pyrite, unroasted	7,699	NA	
Salt	637,000	164,834	Yugoslavia 84,955; Greece 51,087; West Germany 17,776.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	78,900	62,105	U.S.S.R. 47,368; Hungary 13,327.
Soda ash	374,000	179,151	U.S.S.R. 68,900; Czechoslovakia 52,000; Yugoslavia 20,865.
Stone, sand and gravel:			
Dimension stone, worked	21,765	25,789	West Germany 21,591.
Other	2,397	2,197	West Germany 1,965; Japan 232.
Talc, natural steatite	--	953	All to West Germany.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	32,900	1,687	All to Hungary.
Gas, natural and manufactured million cubic feet	7,063	7,063	Do.
Peat and briquets	2,856	4,029	Austria 2,800; Italy 1,229.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	19	807	United States 669; Austria 133.
Refinery products:			
Gasoline ....do	5,188	4,121	United States 1,999; Netherlands 1,474.
Kerosine ....do	60	30	All to Yugoslavia.
Distillate fuel oil ....do	16,376	11,102	West Germany 4,977; France 2,055.
Residual fuel oil ....do	11,421	12,274	Italy 3,516 Spain 2,189; United States 1,948.
Lubricants ....do	2,258	126	Belgium-Luxembourg 70; Spain 30; Netherlands 13.
Other:			
Mineral jelly and wax ....do	83	45	Spain 15; Yugoslavia 8; West Germany 6.
Petroleum coke ....do	355	11	All to Greece.
Unspecified ....do	81	877	West Germany 859.
Total ....do	358,22	28,586	
Crude chemicals from coal, gas, and oil distillation	NA	8,723	West Germany 2,970; Italy 2,885; Netherlands 2,868.

r Revised. NA Not available.

[1] Compiled from United Nations Statistical Office, World Trade Annual, 1973 ed., vs. 1–3, New York, 1975.

[2] Compiled from 1974 edition of Supplement to the World Trade Annual, v. 1 (Eastern Europe), Walker and Company, New York, 1976 (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.

[3] Source: Official export statistics of Romania.

[4] Source: United Nations Economic Commission for Europe, Quarterly Bulletin of Steel Statistics for Europe, v. 25, No. 4, 1974, New York, 1975; v. 26, No. 4, 1975, New York, 1976.

[5] Revised to none.

Table 3.—Romania: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973[1]	1974[2]	Principal sources, 1974
METALS			
Aluminum:			
Bauxite	385,300	561,548	Greece 326,570; Yugoslavia 234,978.
Alumina	112,100	67,192	Greece 51,355; Italy 7,358; Hungary 5,216.
Metal including alloys, unwrought and semimanufactures	7,200	15,529	Hungary 9,722; West Germany 2,472; Italy 1,303; U.S.S.R. 1,264.
Chromium, chromite	30,500	NA	
Copper metal including alloys, all forms	44,400	26,713	U.S.S.R. 9,676; Japan 5,312; Italy 4,569.
Iron and steel:			
Iron ore thousand tons	9,501	10,002	U.S.S.R. 5,699; Spain 241.
Scrap do	NA	663	All from Yugoslavia.
Pig iron, sponge iron, powder and shot do	490	554	U.S.S.R. 497.
Ferroalloys do	151	143	U.S.S.R. 93; Yugoslavia 16; Norway 16.
Steel, primary forms[3] do	r 313	341	NA.
Semimanufactures:[3]			
Bars, rods, angles, shapes, sections do	517	590	NA.
Plates, and sheets do	341	297	NA.
Hoop and strip do	43	54	NA.
Rails and accessories do	86	72	NA.
Wire do	39	51	NA.
Pipes, tubes, fittings do	131	90	NA.
Total do	1,157	1,154	
Lead:			
Ore and concentrate	5,568	14,440	Yugoslavia 6,764; United States 5,069; Poland 2,607.
Oxides	--	505	France 300; Austria 205.
Metal including alloys, all forms	300	820	All from Belgium-Luxembourg.
Manganese:			
Ore and concentrate	3,400	50	Do.
Oxide	670	849	Mainly from Japan.
Mercury 76-pound flasks	5,918	--	
Nickel metal including alloys, unwrought and semimanufactures	4,700	1,998	Netherlands 1,252. Sweden 335; West Germany 203.
Platinum-group metals, unwrought and semimanufactures value, thousands	$1,369	$2,411	West Germany $1,154; France $436; United States $294.
Silver metal, unwrought and semimanufactures do	$65	$310	France $177; West Germany $82; Switzerland $43.
Tin metal including alloys, all forms	3,149	748	Mainly from United Kingdom.
Titanium oxides	2,253	8,013	Japan 4,075; West Germany 2,853.
Tungsten metal, all forms	8	4	Japan 2; France 1; Austria 1.
Zinc:			
Oxide and peroxide	181	2,216	Japan 1,300; Italy 916.
Powder (blue dust)	2,347	1,086	Belgium-Luxembourg 585; West Germany 341; France 160.
Metal including alloys, all forms	9,400	2,766	Italy 2,000; Poland 500.
Other metals including alloys, all forms:			
Oxides, hydroxides and peroxides of metals, n.e.s	--	44	Mainly from West Germany.
Metalloids	1,912	1,733	Mainly from Yugoslavia.
Base metals including alloys, all forms	103	177	Belgium-Luxembourg 52; Japan 51; Italy 23.
NONMETALS			
Abrasives:			
Natural	332	301	All from Italy.
Manufactured	2,573	2,713	Austria 1,102; Italy 647.
Asbestos	46,600	28,521	U.S.S.R. 21,730; Canada 5,852.
Barite and witherite	5,939	8,029	West Germany 3,958; France 1,541; Italy 1,390.
Chalk	1,759	700	All from France.
Clays and clay products:			
Crude clays, n.e.s	18,290	15,501	Greece 10,315; United Kingdom 3,344.
Products:			
Refractory	55,470	70,350	U.S.S.R. 22,847; Yugoslavia 17,750.
Nonrefractory	391	77	Italy 77.

See footnotes at end of table.

Table 3.—Romania: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973[1]	1974[2]	Principal sources, 1974
NONMETALS—Continued			
Cryolite	10,100	1,011	All from Italy.
Diamond, industrial ------value, thousands	$580	$1,501	Mainly from Belgium-Luxembourg.
Diatomite and other infusorial earth	593	585	All from Iceland.
Feldspar and fluorspar	1,131	3,820	Italy 3,156; United Kingdom 400.
Fertilizer materials:			
Crude phosphatic, apatite concentrate gross weight	510,600	530,772	U.S.S.R. 401,600; Israel 100,675.
Manufactured, phosphatic	--	3,618	All from Israel.
Graphite	152	146	All from West Germany.
Magnesite, products	23,400	40,430	Czechoslovakia 37,000; Hungary 1,568.
Mica, worked	10	38	Mainly from France.
Pigments, mineral, iron oxides	588	924	All from West Germany.
Pyrites unroasted	43,000	21,000	U.S.S.R. 21,000.
Stone, sand and gravel	293	266	All from Yugoslavia.
Sulfur:			
Elemental, including colloidal	55,100	64,972	Poland 58,000.
Sulfuric acid	46,000	142,149	Poland 36,155; Hungary 29,550; Greece 22,788.
Talc	--	380	All from Italy.
Other crude nonmetals	--	1,944	Netherlands 897; United Kingdom 494; Japan 260.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	505	521	France 242; United States 186; West Germany 93.
Coal ------thousand tons	1,356	1,616	Czechoslovakia 632; U.S.S.R. 514; Poland 226.
Coke ------do	2,965	2,300	U.S.S.R. 1,175; Czechoslovakia 472; Poland 245.
Hydrogen, helium, rare gases	185	172	All from West Germany.
Petroleum:			
Crude ------thousand 42-gallon barrels	32,223	34,489	NA.
Refinery products:			
Distillate fuel oil ------do	r 28	52	Mainly from France.
Lubricants ------do	r 14	14	Netherlands 4; West Germany 3; Belgium-Luxembourg 3.
Other ------do	77	166	West Germany 125; Yugoslavia 37.
Tar and other coal-, petroleum-, or gas-derived crude chemicals	1,772	21,410	Mainly from U.S.S.R.

r Revised. NA Not available.

[1] Compiled from World Trade Annual, 1973 ed., vs. 1–3, Walker and Company, New York, 1975 (prepared by the Statistical Office of the United Nations) unless otherwise noted.

[2] Compiled from Supplement of the World Trade Annual, v. 1 (Eastern Europe), Walker and Company, New York, 1976 (prepared by the Statistical Office of the United Nations) unless otherwise noted. These data represent exports to Romania as reported by selected trading partner countries.

[3] Source: United Nations Economic Commission for Europe, Quarterly Bulletin of Steel Statistics for Europe, v. 25, No. 4, 1974, New York, 1975; v. 26, No. 4, 1975, New York, 1976.

COMMODITY REVIEW

METALS

Aluminum.—In 1975, Romania's primary aluminum production, including aluminum alloys, reached 204,000 tons, an increase of 9.1% over that of 1974. The single Romanian aluminum plant, located at Slatina, has surpassed its production capacity objective of 200,000 tons per year under the 1971–75 5-year plan. The Slatina plant has been under continuous expansion for the past 10 years and thus has paced the dramatic growth in Romania's modest aluminum industry. By 1980, Romania is planning to produce 255,000 to 260,000 tons of aluminum and aluminum alloys.

Bauxite for Romania's aluminum industry is surface-mined near Dobreşti in the vicinity of Oradea. However, a large part of the bauxite has to be imported. Bauxite is converted to alumina at two alumina plants, each of which has an annual capacity of 250,000 tons. One plant is located near Tulcea in the Danube Delta, and the other near the Oradea bauxite mines.

A new foil-rolling mill at the Slatina aluminum plant, with an annual capacity of 6,500 tons, is to start operation in the near future. The installation will produce various types of aluminum foil of thicknesses ranging between 5 and 200 micrometers, which will be used for fine packaging.

Copper.—Romania's production of copper in 1975 was estimated at 37,000 tons. New deposits of copper ore were discovered in the Moldova Nouă and Roșia Poieni areas. Reportedly, two new copper mines are to be developed there with a combined capacity of 20 million tons of ore per year. In 1975, production of copper ores increased 73.9% over that of 1970.[8]

The most important Romanian copper mines are located at Baia Mare, including Baia Sprie and Cavnic, and the areas of Roşia Montana, Moldova Nouă, Borşa, Bălan, and Leşul Ursului.

Iron and Steel.—Romanian crude steel production for 1975 reached 9.55 million tons, slightly below the planned figure of 10 million tons as outlined in the 1971–75 plan. This production figure showed an increase of 8.0% over that of 1974. Romania's total crude steel production is to reach 11.0 million tons by yearend 1976.

Expansion of the steel industry was a major goal of the 1971–75 5-year plan. In 1975, new production capacities were commissioned at the Galați integrated iron and steel works. The No. 2 unit at the Linz-Donawitz (LD) steelmaking facility began to operate and eventually is to reach a capacity of 3.5 million tons per year. The 1,700-cubic-meter-volume blast furnace No. 4 underwent initial checkout tests. This new furnace incorporates a number of technological advancements over the three installed blast furnaces. It is to contribute significantly to the increase in productive capacity and to cut down coke consumption. A continuous-casting plant, with an annual capacity of 750,000 tons, and a galvanizing shop, with a capacity of 100,000 tons per year, were also commissioned in 1975. At the Hunedoară integrated iron and steel works, a wire mill with a capacity of 280,000 tons per year was put into operation. A medium- and light-product rolling mill with a capacity of 250,000 tons per year was commissioned at the Tîrgovişte special steel complex. The production of welded pipe of various diameters began at the Iasi iron and steel works. Total annual capacity there was reportedly 331,000 tons.

During 1975, work continued at the Galați works on the construction of the 2,700-cubic-meter-volume blast furnace (No. 5) and the 600,000-ton-annual-capacity coke battery (No. 6). At the Reşita integrated iron and steel works, construction proceeded on the blooming mill, having a capacity of 1.3 million tons per year. At the Tîrgovişte special steel complex, a blooming mill of 800,000 tons annual capacity and a strip shop with a capacity of 100,000 tons per year were being installed. A continuous-casting installation, having an annual capacity of 300,000 tons, and an electric furnace shop were also being constructed at the Otelul Roşu iron and steel works during 1975.[9]

In 1975, the share of steel produced by LD converters and electric furnaces was 47%, while the rest was produced by the open hearth method. By 1980, however, 70.3% of the steel in Romania is planned to be produced by LD converters and electric furnaces. This change in steel technology is to reduce fuel consumption by 20%.[10] Medium and thick steel plates continued to account for the bulk of exports in 1975. Exports of sections, wire rod, wire products, and welded pipe increased as a result of the commissioning of new production capacities. Fifteen new types of steel products began to be produced in 1975 at the Galați iron and steel works. Among these were high-resistance shipbuilding steel plates, special steel for automobile bodies, and other steel for the machine-building industry.[11]

By 1980, Romania is to produce 16.6 million to 17.3 million tons of crude steel per year. This figure is to be achieved mainly by the expansion of the Galați works and the operation of the new steel complex being erected at Călăraşi on the Danube. The planned expansion at Galați is to increase the plant's capacity to 10 million tons per year.

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[8] Work cited in footnote 2.
[9] The Steel Market in 1975. United Nations, Economic and Social Council (New York), WP.1/R.4/Add.4, Apr. 15, 1976, pp. 3–5.
[10] Romania Livera (Bucharest). Jan. 8, 1976, pp. 1–3.
[11] Romanian Foreign Trade (Bucharest). No. 1, 1976, p. 34.

Wean United Inc., a U.S. metal equipment manufacterer, has received a contract for over $30 million from Romania for the delivery of five rolling mills for steel plate to be installed at the Galați steelworks.

NONMETALS

Cement.—Total cement production in 1975 was 11.5 million tons, a 2.9% increase over that of 1974. This figure, however, was 15.3% less than the 13.6 million tons set by the 1975 plan. By 1980, Romania plans to produce 19 million to 20 million tons of cement annually. In 1975, total cement exports were 2.8 million tons.

In 1975, construction began on the biggest and most technologically advanced cement plant in Romania, located in Tașca in the district of Neamț. The first production line is to go into operation in 1977. The new plant is to produce high-quality cement employing the dry method.[12] A new type of cement was recently put into production at the binders and asbestos-cement combine of Bicaz. The manufacture of this cement, labeled RIM–A, is based on the partial replacement of clinker with slag, thereby reducing the amount of costly raw material. The resistance and grinding fineness of the cement is unaffected. This cement is to be used particularly in the production of prefabricated building materials.[13]

A new cement production line, with an annual capacity of 320,000 tons, has been commissioned at the Tîrgu Jiu building materials combine.

Fertilizer Materials.—The Romanian fertilizer industry continued its rapid growth in 1975 but fell short of the planned production levels of the 1971–75 national plan. Total fertilizer production in 1975 was 1.7 million tons, an increase of 23% over that of 1974, but representing only 64% of the amount planned for 1975.

During the 1971–75 5-year plan, Romania had been building up its mineral fertilizer capacities by the construction and planning of a number of new facilities. During this time, the fertilizer industry reportedly received 18% of the total national appropriation for investment. When all the new facilities reach capacity operation, Romania will have a total annual productive capacity of over 5 million tons of fertilizers per year, including complex fertilizers, urea, ammonium nitrate, and ammonium sulfate. Romania is planning to export nitrogen fertilizers, urea, and ammonium nitrate primarily to West Germany, France, North Africa, and Latin America.

Two of the 891,000-ton-per-year-complex fertilizer plants went into operation in 1975. These are located at Tîrgu Mures and Craiova. Two more identical plants were scheduled to be commissioned at Arad and Turnu Măgurele in mid-1976. The supply and basic engineering for all four plants was carried out by Davy Powergas, Inc., while the detailed engineering was done in conjunction with the State-owned engineering company, Iprochim. At the Tîrgu Mures complex, bulk storage facilities for 80,000 tons of fertilizer and feedstock have been built. The third ammonia plant at Tîrgu Mures started operating in 1975 and reached designed capacity of 300,000 tons per year. The plant was designed by M. W. Kellogg Co. and constructed by Iprochim for the Combinatul De Ingrasominte Azotase.[14]

The nitrogen and compound fertilizer plant to be constructed at Tecuci was relocated and is to be established at Bacău, in the eastern part of the country some 80 kilometers northwest of the original location.[15] The new complex is to consist of a 300,000-ton-per-year ammonia plant constructed by Kellogg, a 420-ton-per-year urea plant constructed by Coppée-Rust Co., a 480,000-ton-per-year nitric acid plant using the technology supplied by Grande Paroisse (a duplication of the unit already located at Arad), and a 891,000-ton-per-year complex fertilizer plant with units identical to those used at Norway's Norsk Hydro plants. The entire complex is scheduled to be completed in 1978.

The Azot No. 4 unit of the chemical fertilizer combine at Piatra Neamț began operating at full capacity of about 140,000 tons of nitrogen fertilizers and in 1975 produced its first batch of 1,000 tons of urea, which was to be exported. A 20,000-ton-per-year phosphoric acid unit has been installed at the Navodari chemical combine. This

[12] Romanian Foreign Trade (Bucharest). No. 4, 1975, p. 22.
[13] Page 27 of work cited in footnote 7.
[14] Nitrogen (London). No. 98, November–December 1975, p. 18.
[15] Nitrogen (London). No. 100, March–April 1976.

combine produced single and triple superphosphates and had a capacity of approximately 600,000 tons per year.[16]

Lime.—The production of lime in 1975 was 3.1 million tons. A new kiln was commissioned in 1975 at the Bicaz binders and asbestos cement combine, which was to double lime production there and reduce fuel consumption.[17] A modern plant has been commissioned at Tîrâveni for crushing and preparing lime used for the manufacture of carbide.

Sulfur.—The production of sulfuric acid reached 1.4 million tons in 1975, a 6.6% increase over that of 1974. A unit was to be constructed to utilize the pyrite cinders recovered as waste from the sulfuric acid plant located at the Turnu Măgurele complex, where annual sulfuric acid production capacity was 300,000 tons per year, using the Lurgi process. This unit was to produce granules of 55% iron and other byproducts.[18]

MINERAL FUELS

Romania's total primary energy consumption in 1975 reached an estimated 83.3 million tons of standard coal equivalent, an increase of 7.6% over that of 1974. Natural gas provided 52.8% of the total primary energy, while coal represented 22.1%, oil 23.8%, and hydroelectric power 1.3%.

Romania has been giving particular attention to development of its domestic primary energy resources in order to meet its steadily increasing fuel and energy requirements. Increased emphasis was placed on use of solid fuels for the generation of electrical power in order to save hydrocarbons for the petrochemical industry. Marketable coal production increased from 20.5 million tons in 1970 to 27.1 million tons in 1975, and is expected to reach 56 million tons in 1980 and 72 million to 78 million tons by 1990. The share of electric energy generated through the use of solid fuels is to increase from 23.9% in 1975 to 44% in 1980. This is to be achieved by an increase in lignite production, which is expected to rise from 13.5 million tons in 1970 to 47 million tons in 1980 and 60 million to 65 million tons by 1990. The production of electrical energy during 1976–80 is to be increased with the construction of additional thermal electric powerplants (capacity 5.4 million kilowatts to 5.7 million kilowatts).

Production of primary energy derived from fossil fuels and hydroelectric generation increased from 77.0 million tons of standard coal equivalent in 1974 to 81.1 million tons in 1975. The total primary energy balances for Romania for 1974 and 1975 are shown in table 4.

[16] Phosphorous and Potassium (London). No. 80, November–December 1975, p. 15.
[17] Page 28 of work cited in footnote 11.
[18] Sulphur (London). No. 116, January–February 1975, p. 14.

Table 4.—Romania: Total primary energy balance for 1974 and 1975
(Million tons of standard coal equivalent) [1]

Year	Total primary energy	Coal and coke	Crude oil petroleum products	Natural gas	Hydroelectric power
1974: [2]					
Production	77.0	14.1	21.3	40.5	1.1
Imports	10.7	3.6	6.7	--	.4
Exports	10.3	--	9.6	.3	.4
Apparent consumption	77.4	17.7	18.4	40.2	1.1
1975: [3]					
Production	81.1	14.3	21.4	44.3	1.1
Imports	12.0	4.1	7.5	--	.4
Exports	9.8	--	9.1	.3	.4
Apparent consumption	83.3	18.4	19.8	44.0	1.1

[1] 1 ton of standard coal equivalent (SCE) = 7,000,000 kilocalories. Conversion factors used are: Hard coal, 1.0; lignite and brown coal, 0.33; crude oil, 1.47; natural gas, 1.33 (per 1,000 cubic meters); hydroelectric power, 0.125 (per 1,000 kilowatt-hours).
Source: United Nations (New York). World Energy Supplies, Statistical Papers, Series J, No. 18, 1975.
[2] Production data for 1974 were taken from the Statistical Yearbook of the Socialist Republic of Romania (Bucharest), 1975; trade data came from Foreign Trade of the Socialist Republic of Romania (Bucharest), 1974.
[3] Production data reported in Scînteia (Bucharest) Feb. 4, 1976, and in other Romanian sources.

The total electric power produced in Romania in 1975 was 53.7 billion kilowatt-hours and fell short of the 56.6 billion kilowatt-hours planned. At yearend 1975, total capacity of the country's electric powerplants reached 11.5 million kilowatts, an increase of 8.5% over that of 1974 but falling short of the 13.0-million-kilowatt goal of the 1971–75 5-year plan.

During 1971–75, newly installed electric power generating capacity totaled 4.3 million kilowatts, of which 0.7 million kilowatts represented thermal electric powerplants using solid fuel and 1.4 million kilowatts was hydroelectric powerplants.[19] The remaining capacity was fueled by oil.

The electric power plan for 1971–80 had been drastically amended because of postponements in construction of nuclear powerplants which were to have a capacity of 1.8 million kilowatts to 2.4 million kilowatts by yearend 1980. Construction of these plants has been rescheduled to start in 1981. Thus, the figures for the 1976–80 plan had to be revised downward, and a larger amount of fuel oil, gas, and coal is to be utilized for the anticipated electricity requirements.[20]

Coal.—In 1975, Romania produced a total of 29.4 million tons of run-of-mine coal, a slight increase over the 1974 output and considerably below the planned production of 29.8 million tons. The total marketable coal production in 1975 was 27.1 million tons.

Approximately 30% of Romania's 1975 coal production was anthracite and bituminous and came mostly from the Valea Jiului coalfield. The remainder was lignite, from deposits located mostly south of the Carpathian Mountains in the neighborhood of Tîrgu Jiu but with some smaller deposits near Brasov. Total Romanian lignite reserves are estimated at 3 billion tons.

Romania is expected to launch a drive to increase coal production 16% during the 1976–80 5-year plan. Total coal production is to reach 56 million tons by yearend 1980. To meet the coal requirements, new mines, with a total productive capacity of approximately 27 million tons of lignite, are to be brought into operation during 1976–80. Surface mining is to provide 72% of this amount. All of the lignite production increase up to 1985 is to come from new mines. In 1985–90, however, the new production capacity will have to be obtained from underground mines. Romania is planning to increase automation and the use of more productive machinery and equipment in its surface and underground mines.

The development of five new underground mines was started in 1975 in the Jilt lignite basin.[21]

A preliminary agreement was signed on July 1, 1975, between a private U.S. coal mining company and a Romanian State enterprise to develop an underground mine in Buchanan County, Va. The mine, which is to be called Virginia Pocahontas No. 6, is to have a capacity of more than 1 million tons of high-grade coal per year and is to be operated by the U.S. company. The development of the mine will require an investment of over $50 million.[22]

Natural Gas.—Romania's total natural gas production reached 33.3 billion cubic meters in 1975, a 9.4% increase over that of 1974. The nonassociated gas production included in this total was 27 billion cubic meters in 1975.

Romania's natural gas reserves are estimated at 280 billion cubic meters and are largely centered in the Transylvanian Basin around Tîrgu Mures, Turda, Copsa Mică, and Făgăras.

Romania signed a cooperative agreement with the U.S.S.R. to participate in construction of the Orenburg natural gas pipeline. Romania is to finance purchases of Western equipment, pipe, and materials required for the development of the gasfield and the construction of gas-drying and sulfur-removal installation within the Orenburg complex.[23] In return, Romania is to receive 1.5 billion cubic meters of Soviet natural gas per year upon completion of the pipeline late in 1978. The pipeline, construction of which began in the spring of 1975, links the large condensate deposits of the Orenburg region, south of the Urals, with the western border of the U.S.S.R. at Uzhgorod. This 2,750-kilometer pipeline will allow the participating countries to

[19] Work cited in footnote 2.
[20] Revisita Economica (Bucharest). No. 28, July 16, 1976, pp. 1–2.
[21] Romanian Foreign Trade (Bucharest). No. 3, 1975, p. 33.
[22] Buletinul Oficial (Bucharest). P. I, No. 104, Oct. 11, 1975, p. 3.
The Washington Post (Washington, D.C.). July 3, 1975, p. D1.
[23] Page 12 of work cited in footnote 7.

draw up to 15.5 billion cubic meters of natural gas annually.[24]

The natural gas pipeline from the Soviet Union to Hungary, running across Romania, was completed in 1975. Romania, however, has no rights to use any of this gas without further negotiations with the Soviet Union.

Another gas pipeline, which connects the Romanian gasfields to Hungary, is used to export 200 million cubic meters of Romanian natural gas per year.

Oil Shale.—To conserve oil and gas supplies, Romania started construction in 1975 on the nation's first electric powerplant designed to use oil shale as fuel. The powerplant is located at Oraviţa, in western Romania near the Yugoslav border, and will have a capacity of 990 megawatts. In was patterned after two large U.S.S.R. powerplants in Estonia near the Baltic Sea. The plant is to use more than 12 million tons of oil shale per year, which is to be extracted from nearby surface mines.

Petroleum.—Crude oil production in Romania has leveled off, reaching the planned target of 14.6 million tons in 1975, an increase of less than 1% over that of 1974. Romania currently imports approximately 6 million tons of crude oil per year from Saudi Arabia, Iran, Iraq, Libya, and Venezuela, and is the only COMECON [25] country which does not import crude petroleum from the Soviet Union. By 1980, total Romanian crude oil production is to reach 15.5 million tons. Romania was a major exporter of refined petroleum products and operated 11 refineries with an estimated total crude oil processing capacity of 23 million tons per year.

One of Romania's major investment projects during the coming 5-year plan is to be the construction of a large petrochemical complex on the Black Sea, between Navodari and Cape Midia, north of Constanţa. The complex is to include an oil refinery, rubber and synthetic fiber plants, and a special port facility. The total cost of the project will be approximately $1 billion, of which approximately half will be provided by Kuwait. The additional refining capacity will require increased imports of crude oil from the Middle East, probably from Kuwait.

In 1975, Romania continued exploratory and developmental drilling in the Ploieşti-Facsani oil and gas district. Although drilling was extended to greater depths, no significant reserves were located.

Offshore drilling in the Black Sea has become the major effort for future oil exploration. Romania has built its first offshore floating drilling rig (Gloria I), which was launched by the Galaţi shipyard in October 1975.[26] It was provided with ice breakers, bow and stern propellers for increased mobility, and four 122-meter legs that support the rig on the seabed where it can drill to a maximum depth of 6,000 meters.[27]

According to an agreement signed in June 1975, Romania is to provide assistance to Bulgaria in the drilling of deep wells on Bulgarian territory and off the Bulgarian coast in the Black Sea.

Reportedly, the "First of May" petroleum equipment plant at Ploieşti has begun producing a new type of onshore deep drilling rig, identified as F–500, which can reach a maximum depth of 10,000 meters and is highly automated. A hydrorefining installation has been put into operation at the Ploieşti-Sud refinery. The plant has reached capacity operation in the production of high-quality products. The plant has been designed by the Ploieşti Refineries Research and Design Institute and built by T.C.I. Ploieşti.[28]

Nuclear Power.—The first 10-year electrification plan (1966–75) called for two 0.5 million kilowatt to 0.6 million kilowatt nuclear powerplants to be built during this period. The second plan (1971–80) required an installed nuclear powerplant capacity of 1.8 million kilowatts to 2.4 million kilowatts by yearend 1980. The share of nuclear power in the total power production was to amount to 1.2% in 1970, 3.4% in 1975, and 8.5% in 1980. However, the nuclear power program has been delayed, and the first nuclear powerplant was rescheduled to go into operation in 1981. By 1990, Romania plans to have approximately 20% of its electric power generated by nuclear powerplants.

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[24] G.D.R. Foreign Trade (East Berlin). No. 6, 1976, pp. 2–5.

[25] COMECON (CMEA)—Council for Mutual Economic Assistance—comprises the following countries: Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.

[26] Scînteia (Bucharest). Oct. 11, 1975.

[27] Mihaiescu, G. (A New Profession in Socialist Romania: the Drillers of the Blue Field.) Scînteia (Bucharest), Jan. 7, 1976.

[28] Page 28 of work cited in footnote 11.

The Mineral Industry of Sierra Leone

By Janice L. W. Jolly [1]

Sierra Leone's mineral industry experienced a difficult year in 1975. Like most other diamond producers, Sierra Leone had its worst year in recent memory as the world diamond market continued its downward trend that began late in 1973. Iron mining had a setback with liquidation of the Sierra Leone Development Co., Ltd. (DELCO). DELCO had accounted for 11% of the nation's exports in 1975. Repercussions were felt throughout the economy. When the Sierra Leone Petroleum Refining Co., Ltd., lost DELCO as its biggest customer for heavy oil and gas, the company was left with a surplus on its hands. A brighter picture was painted, however, for bauxite mining at Mokanji by the Sierra Leone Ore and Metal Co., Ltd. (SIEROMCO) as expansions were being planned and production maintained.

With the signing of the rutile mining agreement during 1975, the foreign investment climate was interpreted as easing and becoming more favorable. Pressures on the economy from higher prices for petroleum and imported foodstuffs have impressed the Government of the need to increase exports and to adopt a more realistic attitude towards foreign investment including the mining sector. The Government would like to attract investments for domestic processing of Sierra Leone's agricultural and mineral exports. Sierra Leone's new 5-year (1974–79) plan clearly recognizes the need for foreign capital and technology.

The chromite deposits of Sierra Leone received a flurry of attention from several U.S. companies during 1975 as a result of a visit from the Overseas Private Investment Corporation (OPIC). OPIC officials visited several West African countries in April 1975, including Sierra Leone, to determine new investment possibilities. Several mining companies indicated an interest in looking for gold in Sierra Leone. One U.S. company, Diamond Distributors Inc. of New York, acquired a prospecting license for both gold and diamonds.

In May 1975, Sierra Leone joined with 14 other West African countries to form the Economic Community of West African States (ECOWAS). Liberia, Benin, Gambia, Ghana, Guinea, Guinea Bissau, Ivory Coast, Mali, Mauritania, Nigeria, Niger, Senegal, Togo, and Upper Volta were also signatories to this treaty. Sierra Leone was also a beneficiary of the U.S. Trade Act of 1974 and a signatory to the Lome Convention, affording special rights of access to the markets of the European Communities (EC). Sierra Leone joined the 11 member Iron ore Exporters Association in April 1975.

Libya and Sierra Leone signed an agreement for joint cooperation on a number of technical, cultural, and agricultural projects on November 21, 1975. Loans included $10.5 million from West Germany for road building; $7.3 million for schools from the U.S. International Development Association (IDA); and $30 million from the Electricité de France (EDF) for other development schemes.[2]

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[1] Physical scientist, International Data and Analysis.

[2] Africa Report. Loans, Grants and Credits. March–April 1976, v. 21, No. 2, p. 36.

PRODUCTION AND TRADE

Mineral commodities produced by Sierra Leone were valued at an estimated $93 million[3] in 1975 (not including petroleum refinery products) compared with $103 million in 1974. Mineral production figures are shown in table 1. Minerals formed 71% of total export earnings in 1975. Diamond exports were valued at $77.7 million in 1975 compared with $87.4 million in 1974, and iron ore exports were valued at an estimated $14.6 million in 1975. Nearly 87% of Sierra Leone's exports went to the United Kingdom in 1974, with most of the remainder going to the United States (8%), Japan (7%), and West Germany (6%). Imports came from the United Kingdom (46.7%), Japan (20.8%), the United States (19.6%) and West Germany (14.6%). The recommencement of rutile mining is expected to result in greatly increased exports to the United States. If other potential U.S. investments such as those in iron ore materialize, exports to the United States may increase even further. The United States has long been the recipient of a large share of Sierra Leone's rough diamonds.

The latest available statistics on foreign trade in selected mineral commodities are given in the 1974 Minerals Yearbook.

Table 1.—Sierra Leone: Production of mineral commodities

Commodity [1]	1973	1974	1975 [p]
Aluminum, bauxite, gross weight thousand metric tons	603	672	655
Diamond:			
Gem thousand carats	646	670	[e] 560
Industrial do	758	1,000	[e] 840
Total do	1,404	1,670	[e] 1,400
Iron ore, gross weight thousand metric tons	2,405	2,014	1,454
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	350	369	797
Jet fuel do	119	144	201
Kerosine do	144	153	56
Distillate fuel oil do	496	469	304
Residual fuel oil do	846	536	--
Other do	87	12	61
Refinery fuel and losses do	204	68	--
Total do	2,246	1,751	1,419

[e] Estimate. [p] Preliminary.
[1] In addition to the commodities listed, a variety of crude construction materials (clays, sand, gravel, and stone) is 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.

COMMODITY REVIEW

METALS

Chromite.—Renewed interest was being shown in chromite following a visit to Sierra Leone by OPIC officials early in 1975. Chromite occurrences have been traced along a belt 70 miles long. The approximate center of this belt is located near Kenema on a railway. The belt extends northeast to the Gori Hills and southwest to Pujehun. The deposit at Ngelehun was the only one mined and was reported as occurring as lenses in serpentine and talc (altered dunite) over a wide area in the Kambui Hills. These chromite bodies have not been mined since 1963 when the company, Sierra Leone Chrome Mines Ltd., experienced production, transportation, and marketing difficulties and was forced to close down. There were three areas of ore at the Ngelehun

[3] Where necessary, values have been converted from Leones (Le) to U.S. dollars at the rate of Le1=US$1.11.

deposit being mined with three different grades called Amba, Benda, and Waku. The dip of the ore bodies was nearly vertical, the deposit was highly sheared, and the ore was broken into numerous small lenses. The Amba ore averaged 45% Cr_2O_3 and was the best grade. The chrome ratio was reported as varying between 3:1 and 2:1 (Cr:Fe). Over 330,000 tons was extracted and sold between 1973 and 1963. The largest shipment in any one year was 24,000 tons. The lump ore averaged 39% Cr_2O_3. The grade of ore, marketed as refractory-grade chrome, was unsuitable for the ferrochrome and chemical industries. In 1939, the Sierra Leone Government gave the company assistance in the form of a 25-year monopoly and a freight subsidy on the railway. Production diminished after 1959 because of a fall in world prices. The end of the railway subsidy was a contributory cause to the company's decision to cease operations.[4] Reserves were estimated in 1959 to be about 326,386 tons of chromite with an average grade of 38% Cr_2O_3 in the area around the mine itself. Reserves of minable ore were apparently difficult to estimate. Several U.S. companies were reported as taking out prospecting licenses for chromite in 1975.

Gold.—A U.S. mining company, Diamond Distributors Inc., was to prospect for gold in the Valunia area. The company was reportedly[5] known previously as the Diamond Export Co. Valunia Chiefdom was selected by the Government for the company's operation because gold mining in the chiefdom was once very successful. Royalties and taxes were to go towards the development of the chiefdom. A special exclusive prospecting license was also granted to Diamond Distributors Exploration Inc. to prospect for gold and diamonds in an area covering 57.80 square miles in Baomahun area of the Bo District.

Iron Ore.—Iron ore mining operations of DELCO ceased at yearend 1975 as the company was placed into voluntary liquidation following continued heavy losses. Substantial Government loans had been made (totaling nearly $5 million) over the last 2 years in an effort to continue mining despite problems encountered. In November 1974, the Sierra Leone Government loaned DELCO approximately $2 million at 9% repayable over 3 to 5 years. In July 1975, a further loan of $2 million was also made. Finally, a subsidy of $500,000 was made in September 1975. One purpose of the Government support was to enable negotiations with Bethlehem Steel Corp. of the United States to continue. Against a background of a worldwide declining activity in the steel industry, however, no acceptable agreement could be reached although negotiations were apparently continuing. Ceasing operations will bring to close a 40-year period of activity. William Baird and Co.'s share of DELCO (95%) was estimated at a book value of approximately $4 million.[6] The Sierra Leone Government was the largest creditor. The Government was seeking another company to manage operations. These include running of the rail link between the mine and the Port of Pepel, which was also owned by the company. The Government was also interested in attracting foreign investment for the Tonkolili iron deposits.

Titanium Minerals.—The Sierra Leone Government and Sierra Rutile Ltd. (SRL) officials signed the final agreement for mining the Gbangbama rutile deposits on May 23, 1975. The Sierra Leone Parliament approved the SRL rutile agreement on July 3, 1975. A recent estimate puts reserves at 187 million tons of alluvium containing 3 million tons of rutile. The investment was expected to total about $28 million, of which Bethlehem Steel International Corporation, which owns 85% of SRL, would provide $19 million. The U.S. Export-Import Bank was to provide $9 million. An agreement was arranged between Nord Resources Inc., a U.S. company and Bethlehem for Nord's share of the financing. Bethlehem will advance or otherwise provide on behalf of Nord, all phase III costs in respect to Nord's 15% equity interest and pay $1.75 million to Nord. For consideration of these payments, Nord transferred 5% of the former 20% interest in SRL and relinquished its option right and obligation to purchase an additional interest. Nord thus retained a 15% equity interest in SRL. Nord was responsible for the man-

[4] Andrews-Jones, C.A. Geology and Mineral Resources of the Northern Kambui Schist Belt and Adjacent Granulites. Geol. Survey of Sierra Leone, Bull. 6, 1966, pp. 94–95.
[5] Sierra Leone Trade Journal (Freetown). Gold To Be Mined in Sierra Leone. V. 15, No. 2, 1975, p. 73.
[6] Mining Journal (London). Sierra Leone Development. Oct. 17, 1975, p. 302.

agement of phases I and II of the project which determined the ore reserves and feasibility studies. A 24-cubic-foot bucket ladder dredge will be used in the mining. Production of rutile at rates of 100,000 to 125,000 tons per year, were planned to start by late 1977. The Bayer-Preussag Mining Group currently holds two special exclusive prospecting licenses for 560 square miles in the Moyamba District. Forty-six persons were employed in 1975. Prospecting operations were suspended early in 1975. Erection of a pilot plant was being planned for 1976. It was also reported that the Sierra Leone Ore and Metal Company, Ltd. (SIEROMCO), would start rutile prospecting in the Bo area.

NONMETALS

Diamond.—Exports of diamonds are restricted by a variety of methods linked with the marketing services of the Central Selling Organization (CSO) cartel. Restrictions vary between the two major producing systems, the National Diamond Mining Co. (DIMINCO) and the Alluvial Diamond Mining Scheme (ADS). DIMINCO's rate of production and exploration of new areas may be limited. The export license may be also limited for DIMINCO production to about five buying firms. Two of these are U.S. firms that are obligated to buy fixed percentages. Fifty percent of DIMINCO production goes to the Diamond Corporation of West Africa Ltd. (DICORWAF) and is subject to 7½% ad valorem export tax. Restrictions on exports under the ADS scheme, which consists of thousands of small-scale licensed diggers, is accomplished by licensing. To help curb smuggling, the Government licensed four new firms in 1974 to buy and export ADS diamonds in competition wth the Government Diamond Office (GDO). The same 7½% ad valorem export tax applies to ADS diamonds.

In 1975, DIMINCO, which is 51% state owned and the rest owned and managed by Selection Trust Ltd., saw its production drop from the 1974 level by almost 7% to 738,000 carats. For the first time, the company dropped the planned production rate. Over the past 2 years, costs have risen 17.5% while diamond prices rose in 1975 by only 4.5%. Drastic modifications to the scale of operations were contemplated in order to remain viable. DIMINCO accounts for approximately 53% of total diamond exports, which form 84% of the total value for all minerals produced and 60% of the total national export value for 1975. Negotiations were being held between the Government and Sierra Leone's Selection Trust over management of DIMINCO. Production from individual alluvial miners also worsened as heavy rains affected their workings. In March 1975, a total of 14,204 persons were engaged under the Alluvial Diamond Mining scheme. Alluvial mining slumped from 917,000 carats in 1974 to 645,000 carats in 1975. Smuggling of Sierra Leone diamonds through Liberia and Guinea had also dropped to the lowest levels in recent times.

Marine Salt.—A new salt factory was opened at Suein in the Ribbi Chiefdom, Moyamba Province. The factory created jobs for 150 Sierra Leoneans and was to produce salt from marine water with solar energy.

MINERAL FUELS

Petroleum.—A request was approved by the Sierra Leone Government for seismic testing along the Sierra Leone coast by an international exploration group composed of several European oil companies. Most previous exploration licenses have expired. In the first 6 months of 1975, petroleum imports were 250,473 barrels of crude oil and 47,607 barrels of distillate fuel oil. Nigeria, Congo Brazzaville, and Trinidad and Tobago were the principal sources of crude.

The Mineral Industry of the Republic of South Africa

By Miller W. Ellis [1] and Charles W. Sweetwood [2]

The mineral industry was the most important single factor in the economy of the Republic of South Africa during 1975, and accounted for nearly 17% of the country's gross domestic product. The quantity of mineral production increased 8% over the record output of 1974. Quantity and value of local sales increased 6% and 3%, respectively, and exports increased 14% in quantity and 3% in value. Imports of mineral commodities, excluding petroleum, were held to a 3% increase in quantity and their value decreased 23% to produce a more favorable balance of trade and improve the country's foreign exchange credit.

For the first time, the value of mineral products exceeded 4 billion rand(R), reaching a total of R4.27 billion ($5.83 billion)[3] compared with R3.95 billion ($5.81 billion) in 1974. The 8% increase in terms of domestic currency was equivalent to a 0.35% increase in terms of U.S. dollars as a result of the rand's devaluation to R1=US$1.15 in September 1975. Because of commitments of capital to major projects for expansion of the mineral industry, neither the Government nor the private sector embarked on significant new ventures in a year of general recession, but a number of construction programs remained on or ahead of schedule. Construction of the railway line for the transport of iron ore from Sishen to Saldanha Bay was almost completed, and equipping of port facilities there for loading 350,000-deadweight-ton ore carriers at a rate of 7,500 tons per hour was expected by late 1976. Commissioning of coal loading facilities at Richards Bay was scheduled for early 1976. The South African Iron and Steel Industrial Corp. Ltd. (ISCOR) commenced active production at its new open pit mine at Sishen in November, utilizing 9.2-cubic-meter P and H shovels and 150-ton Wabco Haulpak rear-dump trucks, some of the largest equipment of its type yet imported into the country.

PRODUCTION AND TRADE

The Republic of South Africa continued to lead the world in production of antimony, chromite, gem diamonds, gold, platinum-group metals, and vanadium, and was an important producer of asbestos, coal, fluorspar, iron, manganese, phosphate, uranium, and vermiculite. Production of copper, lead, tin, zinc, cement, salt, and sulfuric acid was adequate to provide a high degree of self-sufficiency for domestic industries. Except for copper, gold, and uranium, the production and/or sales value of all these commodities increased in 1975. Production of copper decreased because of the depressed world market price; this factor, as well as mining of

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[3] Where necessary, values have been converted from South African rand (R) to U.S. dollars at the rate of R1=US$1.3663 (average of 1975 monthly averages as given in v. 30 of International Financial Statistics). The rate for 1974 was R1=US$1.471.

lower grade ore, was also responsible for the decline in production of gold and byproduct uranium.

The mineral industry of the Republic of South Africa was important to the world economy and contributed to the mineral production in neighboring countries. Part of this contribution was the development of transport and port facilities, and part the continued expansion of mineral production and processing plants and of industries producing mining equipment. A large part of the Republic's influence on the world economy was due to its production of gold, platinum, and diamond, but the production of less glamorous metals and minerals was also important. Details of mineral production are shown in table 1, exports in table 2, and imports of mineral commodities in table 3. Table 4 compares the value of domestic sales and exports of major mineral commodities, including ore, concentrate, slag, and other products.

Table 1.—Republic of South Africa: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Aluminum metal	52,800	75,000	75,900
Antimony concentrates:			
Gross weight	25,870	25,212	26,160
Metal content	r 15,705	15,170	15,924
Beryllium, beryl concentrate, 11% to 12% BeO	52	2	3
Chromium, chromite, gross weight:			
More than 48% Cr_2O_3	30,120	20,531	15,230
44% to 48% Cr_2O_3	957,783	938,573	1,127,519
Less than 44% Cr_2O_3	661,727	917,809	932,629
Total	1,649,630	1,876,913	2,075,378
Columbium-tantalum concentrate ......kilograms	--	300	--
Copper:			
Mine output, metal content	175,797	179,111	178,927
Metal:			
Smelter	150,400	147,800	149,700
Refined	90,600	88,500	86,400
Gold, primary ......thousand troy ounces	27,495	24,888	22,938
Iron and steel:			
Iron ore and concentrate ......thousand tons	10,955	11,553	12,298
Pig iron ......do	4,331	4,621	5,177
Ferroalloys ......do	556	636	747
Crude steel ......do	5,628	5,832	6,552
Iron and steel semimanufactures:			
Cast iron and steel ......do	r 528	546	652
Rolled products ......do	3,783	3,896	4,176
Lead, mine output, metal content	1,623	2,487	2,704
Manganese ore and concentrate, gross weight:			
Metallurgical:			
Over 48% Mn	934,983	1,138,323	199,274
45% to 48% Mn	278,193	218,185	1,379,230
40% to 45% Mn	246,443	264,464	232,947
30% to 40% Mn	2,629,137	3,026,152	3,872,052
Total	4,088,756	4,647,124	5,683,503
Chemical:			
Over 65% MnO_2	8,203	4,996	6,849
35% to 65% MnO_2	78,671	93,266	78,680
Total	86,874	98,262	85,529
Grand total	4,175,630	4,745,386	5,769,032
Manganiferous iron ore, 15% to 30% Mn, 20% to 35% Fe	66,527	89,602	111,703
Nickel:			
Mine output, metal content	19,426	22,100	20,754
Electrolytic metal	15,000	17,000	10,000
Platinum-group metals:			
Platinum-group metal content of concentrate, matte, and refinery products ......thousand troy ounces	2,360	2,832	2,620
Osmiridium from gold ore e ......troy ounces	2,800	2,500	2,400
Silver metal, primary ......thousand troy ounces	3,652	2,699	3,084
Tin:			
Concentrate:			
Gross weight	5,056	5,149	5,652
Metal content	r 2,677	2,542	2,643

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS—Continued			
Tin—Continued			
Metal, primary	874	854	780
Tungsten concentrate, 60% WO_3:			
Gross weight ... kilograms	1,000	--	--
Tungsten content ... do	550	--	--
Uranium oxide (U_3O_8)	3,094	3,074	2,809
Vanadium:			
Vanadiferous slag, gross weight	r 34,074	34,522	41,690
Vanadium content of:			
Vanadiferous slag produced e	r 4,770	r 4,833	5,837
Vanadium pentoxide and vanadate products e	r 3,437	r 3,318	4,808
Total	8,207	8,151	10,645
Zinc:			
Concentrate:			
Gross weight	34,031	67,993	127,624
Metal content	17,016	33,995	63,812
Smelter	58,100	65,400	63,700
Zirconium concentrate (baddeleyite)	4,956	11,978	11,594
NONMETALS			
Asbestos:			
Amosite	106,477	94,543	88,411
Anthophyllite	425	822	1,912
Chrysotile	69,807	82,430	99,660
Crocidolite	155,941	155,477	164,727
Total	r 332,650	333,272	354,710
Barite	2,014	1,547	795
Cement, hydraulic ... thousand tons	6,864	7,296	7,176
Clays:			
Bentonite	25,080	37,803	37,549
Fire clay	291,503	332,066	294,086
Flint clay	261,264	303,859	255,100
Fuller's earth	916	--	--
Kaolin	38,615	48,844	56,808
Corundum, natural	269	252	241
Diamond:			
Gem ... thousand carats	3,448	3,425	3,327
Industrial ... do	4,117	4,085	3,968
Total ... do	7,565	7,510	7,295
Diatomite	528	786	649
Feldspar	31,692	39,540	30,354
Fertilizer materials, crude natural phosphate rock ... thousand tons	2,063	7,824	11,626
Fluorspar:			
Acid grade	185,304	193,565	172,270
Ceramic grade	4,475	4,989	10,294
Metallurgical grade	20,545	9,379	20,019
Total	210,324	207,933	202,583
Gem stones, semiprecious:			
Emerald crystals ... kilograms	1,272	2,242	2,375
Tiger's eye ... do	74,794	112,968	187,175
Graphite	1,029	1,554	523
Gypsum, crude	483,239	563,448	538,622
Kyanite and related materials:			
Andalusite	60,702	64,008	77,149
Sillimanite	19,317	13,087	16,911
Lime ... thousand tons	r 1,324	1,199	1,328
Lithium minerals (spodumene)	--	1	--
Magnesite, crude	80,189	104,614	61,202
Mica:			
Sheet ... kilograms	219	321	--
Waste	6,009	2,696	2,511
Pigments, mineral, natural:			
Ochers	1,738	2,061	1,368
Oxides	583	562	1,361
Umber	--	--	556
Pyrite, gross weight	551,113	570,840	650,738
Quartz, quartzite and glass sand (silica)	792,009	898,230	1,155,503
Salt	391,249	220,839	264,412
Silcrete	24,861	15,234	8,086

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Stone, sand and gravel, n.e.s.:			
Dimension stone:			
Granite: [1]			
Sawn slabs	19,407	22,909	33,576
Rough blocks	316,805	318,918	282,341
Marble	3,147	18,120	21,839
Crushed and broken stone:			
Limestone [1] thousand tons	r 14,142	14,887	13,737
Shale do	r 357	517	393
Sulfur:			
Content of pyrite	220,400	228,300	260,300
Byproduct:			
From metallurgy	89,600	104,700	51,700
From petroleum			43,000
Total	310,000	333,000	355,000
Talc and related materials:			
Pyrophyllite (wonderstone)	4,743	8,510	6,782
Talc	7,100	9,589	9,236
Vermiculite	156,461	182,613	207,529
MINERAL FUELS AND RELATED MATERIALS			
Carbon black e	30,000	r 37,500	40,400
Coal:			
Anthracite thousand tons	1,408	1,435	1,591
Bituminous do	60,944	64,621	67,849
Total do	62,352	66,056	69,440
Coke:			
Oven and beehive do	3,593	e 3,600	4,443
Gashouse, low and medium temperature do	99	e 100	e 100
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	r e 25,487	26,039	31,939
Jet fuel do	e 2,589	2,297	3,144
Kerosine do	e 2,479	2,339	3,400
Distillate fuel oil do	e 21,301	20,923	30,220
Residual fuel oil do	e 20,427	21,440	29,454
Lubricants do	e 1,680	1,812	2,171
Other do	e 4,941	2,741	7,715
Refinery fuel and losses do	e 5,313	5,123	6,651
Total do	r e 84,217	82,714	114,694

e Estimate. r Revised. p Preliminary.
[1] Local sales plus exports. Production not reported.

Table 2.—Republic of South Africa: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975
METALS			
Aluminum metal, unwrought [2]	5,200	13,900	13,700
Antimony ore and concentrate, gross weight	r 29,794	32,530	12,247
Beryllium, beryl concentrate, gross weight	149	--	15
Chromium:			
Chromite ore and concentrate, gross weight:			
Chromium oxide content 44% or less	480,064	489,086	473,603
Chromium oxide content 44% to 48%	468,210	291,676	433,648
Chromium oxide content over 48%	--	73	--
Total	948,274	780,835	907,251
Chromite sand, gross weight:			
Chromium oxide content 44% or less	14,562	9,146	40,480
Chromium oxide content 44% to 48%	129,910	272,486	301,674
Chromium oxide content over 48%	96	--	--
Total	144,568	281,632	342,154
Copper, blister and refined, unwrought	111,862	e 122,938	e 101,051
Iron and steel:			
Iron ore, gross weight:			
Hematite	2,599,875	2,119,331	e 2,522,725
Magnetite	818,861	e 774,237	e 814,379
Total	3,418,736	2,893,568	3,337,104
Scrap [3]	1,000	100	5,700
Pig iron	[2] 442,200	[2] 179,300	e 50,700
Sponge iron and powder [3]	400	19,600	15,800
Ferroalloys: [3]			
Ferromanganese	276,300	346,900	276,000
Ferrochrome	175,200	194,800	283,700
Ferrosilicon	36,500	40,100	36,100
Other	25,400	38,800	34,100
Ingots and other primary forms [3]	90,800	100,400	31,300
Semimanufactures: [3]			
Bars and rods	59,400	71,100	31,600
Angles, shapes, sections	97,900	65,600	45,300
Plate and sheet	241,100	268,400	170,900
Hoop, strip, coil	22,000	28,100	5,100
Rails and accessories	35,900	31,600	21,800
Wire	8,200	8,500	5,600
Tubes, pipes, fittings (including cast pipe)	r 13,200	15,700	12,400
Castings and forgings	1,600	4,900	5,400
Total	r 479,300	493,900	298,100
Lead, unwrought metal	(1)	1,141	5,557
Manganese ore, gross weight:			
Metallurgical	3,509,337	3,020,892	3,401,376
Chemical	320	710	1,327
Manganiferous	167,516	116,859	237,684
Total	3,677,173	3,138,461	3,640,387
Nickel, unwrought	r 10,300	14,434	19,883
Platinum-group metals including alloys, all forms e thousand troy ounces	762	1,679	1,831
Tin concentrate, gross weight	1,613	1,768	2,273
Vanadium (V_2O_5 content) e	11,000	11,600	13,100
Zinc concentrate, gross weight	12,631	39,422	66,706
Zirconium (baddeleyite) ore and concentrate	4,883	6,256	4,102
NONMETALS			
Asbestos:			
Amosite	101,361	90,109	173,165
Anthophyllite	178	484	1,406
Chrysotile	57,737	71,669	112,405
Cape Blue	154,902	159,029	257,273
Transvaal Blue	2,347	610	--
Total	r 316,525	321,901	544,249
Barite	5	--	--
Cement e thousand tons	50	354	343
Clays and clay products:			
Bentonite:			
Crude	1,493	1,675	1,595
Processed	472	101	158
Flint clay:			
Raw	9,137	678	2,443
Calcined	113,142	149,729	114,319
Fuller's earth	629	21	--

See footnotes at end of table.

Table 2.—Republic of South Africa: Exports of selected mineral commodities [1] —Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975
NONMETALS—Continued			
Clays and clay products—Continued			
Kaolin:			
Crude		1,804	114
Milled	629	240	490
Washed		91	30
Feldspar	8,003	3,558	1,878
Fertilizer materials: Phosphate rock:			
Ore	1,206	7,000	--
Concentrate		30,097	13,229
Fluorspar:			
Acid grade	97,308	111,382	126,061
Ceramic grade	--	--	39
Metallurgical grade	17,228	12,206	454
Total	114,536	123,588	126,554
Gem stones except diamond: Emerald crystals kilograms	2,549	1,963	1,045
Graphite (processed)	901	954	434
Gypsum	22,039	10,165	14,069
Kyanite and related materials:			
Andalusite	16,637	18,759	23,773
Sillimanite	15,363	18,737	16,524
Lime, slaked	9,747	9,976	9,043
Mica:			
Waste	3,794	2,535	510
Ground	2,805	2,037	2,542
Pigments, mineral:			
Ochers	1,584	1,601	896
Oxides	174	183	22
Salt	r 40,238	10,133	6,780
Stone, sand and gravel:			
Dimension stone:			
Granite:			
Sawn slabs	8,584	6,915	5,660
Raw blocks	296,519	305,813	225,746
Marble	--	4,887	2,097
Quartzite tiles	2,515	935	5,046
Slate tiles	2,330	2,618	2,221
Other stone:			
Limestone	50,165	50,793	42,858
Quartzite	395	20	16
Slate (including paving)	786	665	190
Silica:			
Crude	1,972	186	40
Processed	1,243	1,231	497
Talc and related materials:			
Talc and steatite	r 135	214	116
Pyrophyllite (wonderstone)	6,670	5,335	3,367
Vermiculite	r 142,874	149,665	185,943
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite thousand tons	905	1,035	1,565
Bituminous do	1,039	1,242	1,122

e Estimate. r Revised.

[1] Because official South African trade statistics provide data only on the total value of exports of each commodity class (no data on quantity and no data on destinations), this table has been compiled chiefly from information appearing in the quarterly publication "Minerals" issued by the Department of Mines of the Republic of South Africa. Figures obtained from supplemental sources and Bureau of Mines estimates are individually footnoted.

[2] World Bureau of Metal Statistics. World Metal Statistics. July 1978, 108 pp.

[3] British Steel Corporation. International Iron and Steel Statistics. Republic of South Africa. 1973, 42 pp.; 1974, 42 pp.; and 1975, 58 pp.

Table 3.—Republic of South Africa: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite	20,589	7,188	Mainly from Argentina.
Oxide and hydroxide	[r] 119,845	169,487	Mainly from Australia.
Metal including alloys:			
Scrap	440	202	NA.
Unwrought	878	842	France 300; West Germany 175; Netherlands 168.
Semimanufactures	[r] 8,023	12,086	United States 4,258.
Arsenic:			
Oxides and acids	133	117	Mainly from United Kingdom.
Metal	3	1	NA.
Chromium:			
Chromite	122,703	75,948	NA.
Oxide and hydroxide	94	469	West Germany 250; United States 94; U.S.S.R. 46.
Cobalt, oxide and hydroxide	18	15	West Germany 7; Canada 6.
Copper:			
Ore and concentrate	37,138	76,770	Chile 47,199; Italy 29,571.
Metal including alloys:			
Scrap	278	1,088	United States 319; Hong Kong 255; Canada 117.
Unwrought	[r] 5,915	9,713	NA.
Semimanufactures	[r] 1,927	4,490	United Kingdom 1,570; West Germany 1,348.
Gold metal, unworked or partly worked troy ounces	8,256	11,462	United Kingdom 6,759.
Iron and steel:			
Ore and concentrate	1	10,978	NA.
Metal:			
Scrap	24,846	10,383	United Kingdom 1,486.
Pig iron, ferroalloys, similar materials	[r] 9,523	9,232	Sweden 1,908.
Steel ingots and other primary forms	[r] 27,559	27,574	United Kingdom 8,051; United States 7,600; Italy 6,341.
Semimanufactures:			
Bars and rods	[r] 108,142	160,260	West Germany 52,667; Japan 36,825; Netherlands 18,073.
Angles, shapes, sections	[r] 17,058	63,196	Japan 36,918; Belgium-Luxembourg 10,261.
Plate and sheet	[r] 303,855	705,408	West Germany 242,402; Japan 223,548.
Hoop and strip	[r] 39,816	46,040	Mainly from West Germany.
Rails and accessories	2,463	52,577	Do.
Wire and wire rod	11,877	19,720	West Germany 6,818; Belgium-Luxembourg 3,114.
Tubes, pipes, fittings	[r] 34,725	46,069	Japan 20,855; West Germany 7,625.
Castings and forgings, rough	4,714	3,832	Belgium-Luxembourg 986; France 908; West Germany 684; Australia 530.
Total	[r] 522,650	1,097,102	
Lead:			
Ore and concentrate	10,420	25,508	United States 18,158; New Zealand 7,350.
Oxides	22	31	Mainly from United Kingdom.
Metal including alloys:			
Scrap	2,684	4,665	United States 1,317; Australia 315.
Unwrought	6,129	4,043	Australia 99; Canada 82.
Semimanufactures	[r] 87	28	NA.
Magnesium metal including alloys, all forms	617	519	Mainly from United States.
Manganese:			
Ore and concentrate	606	1,029	United Kingdom 753; Netherlands 150.
Oxides	828	846	Japan 310; United States 248; United Kingdom 152; Belgium-Luxembourg 136.
Mercury 76-pound flasks	1,711	1,825	United Kingdom 379; Japan Kingdom 251.
Molybdenum metal including alloys, all forms	5	8	Mainly from United States.
Nickel metal including alloys, all forms	566	1,390	United Kingdom 379; Japan 119.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Platinum-group metals including alloys, all forms ----troy ounces--	1,565	14,254	United States 8,727; United Kingdom 3,321.
Silicon and tellurium ----	226	385	France 208; United Kingdom 71; Canada 54.
Silver:			
Waste and sweepings ---troy ounces--	54,343	581,683	Mainly from United States.
Metal including alloys, all forms do----	1,040,666	1,179,750	United Kingdom 418,660; West Germany 325,100.
Tin:			
Ore and concentrate ----	89	23	NA.
Oxides ----	19	23	United Kingdom 11; West Germany 7.
Metal:			
Scrap ----	r 30	3	NA.
Unwrought and semimanufactures	994	1,177	United States 868; Belgium-Luxembourg 303.
Titanium (ilmenite):			
Ore and concentrate ----	--	17,130	Mainly from Australia.
Oxides ----	546	602	Mainly from Belgium-Luxembourg.
Tungsten:			
Ore and concentrate ----	468	539	Australia 290; Brazil 145; Canada 74.
Metal including alloys, all forms ----	49	71	Netherlands 11; Ireland 7.
Zinc:			
Ore and concentrate ----	16,036	38,077	Canada 21,749; Peru 12,526; Australia 3,800.
Oxides ----	303	400	United Kingdom 183; West Germany 182.
Metal including alloys:			
Scrap including powdered dust---	r 1,154	604	Mainly from Australia.
Unwrought ----	918	4,691	Mexico 601; Japan 477.
Semimanufactures ----	177	384	Mainly from U.S.S.R.
Zirconium ore and concentrate ----	72	41	NA.
Other:			
Ores and concentrates:			
Of molybdenum, tantalum, vanadium ----	271	256	United States 133; Canada 118.
Of base metals n,e..s ----	3,152	5,728	Mainly from Australia.
Ash and residue containing nonferrous metals ----	r 1,344	1,943	United States 708; Australia 255; Spain 240; Canada 222.
Oxides, hydroxides, peroxides of metals, n.e.s ----	212	351	United States 193; West Germany 84.
Elemental boron, phosphorus, and/or selenium ----	69	100	United Kingdom 54; Japan 27.
Metals including alloys, all forms:			
Alkali, alkaline earth, rare-earth metals ----	31	6,869	NA.
Pyrophoric alloys ----	8	6	Austria 1; West Germany 1.
Base metals including alloys, all forms, n.e.s.[1] ----	421	436	Mainly from United Kingdom.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc-	2,441	4,956	NA.
Grinding and polishing wheels and stones ----	605	669	West Germany 189; United Kingdom 114.
Asbestos ----	19,388	30,385	NA.
Barite ----	3,211	4,684	Italy 2,216; West Germany 683.
Boron materials:			
Crude natural borates ----	1,862	1,431	United States 876; Netherlands 251; Turkey 250.
Acid ----	r 6,625	8,805	Mainly from Japan.
Bromine ----	13	32	Mainly from Israel.
Cement ----	71,991	84,691	United Kingdom 12,557; France 4,605.
Chalk ----	6,627	9,067	Mainly from Israel.
Clays and clay products:			
Crude clays and refractory minerals--	17,151	29,488	United States 19,240; United Kingdom 4,832.
Products:			
Refractory ----	r 35,188	34,828	West Germany 15,370; Austria 5,932; United Kingdom 5,724.
Nonrefractory ----	5,600	8,682	NA.
Cryolite and chiolite ----	776	1,148	Republic of Korea 500; Denmark 432.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Diamond:			
Gem ----carats--	63,000	61,500	United Kingdom 41,000; Belgium-Luxembourg 13,500.
Industrial ----thousand carats--	10,164	7,741	United Kingdom 3,305; Ireland 522.
Diatomite and other infusorial earth ----	6,747	8,805	Mainly from Japan.
Feldspar, leucite, nepheline syenite ----	184	1,159	United States 535; West Germany 250.
Fertilizer materials:			
Crude:			
Nitrogenous ----	42	235	Poland 134.
Phosphatic ----	385	34	NA.
Potassic ----	177,410	309,820	West Germany 65,705; Israel 24,030.
Other ----	4,552	6	NA.
Manufactured:			
Nitrogenous ----	31,133	78,436	Italy 34,652; Portugal 23,978.
Phosphatic:			
Thomas slag ----	5,699	1,795	All from Belgium-Luxembourg.
Other ----	563	8	NA.
Potassic ----	45,053	18,179	Mainly from West Germany.
Other including mixed ----	497	917	Mainly from Belgium-Luxembourg.
Graphite, natural ----	234	557	Mainly from Norway.
Gypsum and plasters ----	7,184	6,179	West Germany 4,174; Spain 1,080.
Lime ----	r 530	5,185	United Kingdom 2,541; United States 1,764.
Lithium minerals, not further described--	437	270	NA.
Magnesite ----	122,256	97,275	Japan 8,879; United Kingdom 6,042.
Mica:			
Crude, including splittings and waste-	469	357	NA.
Worked, including agglomerated splittings ----	48	73	United Kingdom 33; United States 21.
Pigments, mineral:			
Natural, crude ----	811	773	Austria 442; United Kingdom 262.
Iron oxides, processed ----	r 3,289	4,961	West Germany 3,790; United Kingdom 374.
Precious and semiprecious stones, except diamond [2] ----value, thousands--	$2,099	$1,208	Ireland $281; Israel $134.
Pyrite ----	37	34	NA.
Salt ----	1,793	16,594	Mainly from Australia.
Sodium and potassium compounds, n.e.s.:			
Caustic soda ----	r 15,904	70,352	France 58,022; United Kingdom 7,216.
Caustic potash ----	1,531	2,140	West Germany 879; France 713.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous ----	576	744	Mainly from Italy.
Slate ----	211	--	
Other ----	552	11,524	NA.
Worked ----	r 2,707	2,166	Italy 1,626; Portugal 258.
Dolomite ----	133	256	Mainly from Sweden.
Gravel and crushed stone ----	91,030	55,151	NA.
Limestone ----	40	55	NA.
Quartz and quartzite ----	23	132	NA.
Sand, excluding metal bearing ----	1,570	924	Switzerland 145; United States 126.
Sulfur:			
Elemental:			
Other than colloidal ----	206,662	326,473	Canada 275,066; United States 27,343.
Colloidal ----	593	33,413	Mainly from United States.
Sulfur dioxide ----	r (3)	2	NA.
Sulfuric acid ----	112	30	NA.
Talc and steatite ----	2,985	3,304	Republic of Korea 1,256; Italy 651; Norway 383.
Other nonmetals, n.e.s.:			
Crude ----	2,586	4,258	Greece 2,400; Australia 944; West Germany 431.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture-	38,675	28,072	Mainly from Canada.
Slag and ash, n.e.s ----	198	289	NA.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Other nonmetals, n.e.s.—Continued			
Oxides and hydroxides of magnesium, strontium, barium	579	737	United States 232; West Germany 147; United Kingdom 130.
Iodine and fluorine	12	17	Japan 7; Chile 6.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	r 1,244	3,959	Austria 743; Belgium-Luxembourg 515; United Kingdom 493.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	4,343	1,935	Mainly from United States.
Carbon and carbon black	4,208	7,360	United States 3,611; United Kingdom 1,735; West Germany 1,240.
Coal, all grades, including briquets	727	95,678	United States 10,818.
Coke and semicoke	650	212	NA.
Gas, hydrocarbon, natural	394	81	NA.
Hydrogen and rare gases	51	66	United States 24; Japan 10.
Peat	217	256	West Germany 130.
Petroleum: [4]			
Refinery products:			
Mineral jelly and wax thousand 42-gallon barrels	260	384	West Germany 106; United States 46; Japan 43.
Bitumen and other residues 42-gallon barrels	r 18,896	11,146	Netherlands 6,185; United States 4,025.
Bituminous mixtures, n.e.s do	r 5,964	9,102	United States 5,696; United Kingdom 1,431.
Pitch do	r 8,500	11,061	Netherlands 8,873; United States 1,818.
Petroleum coke do	66,099	163,843	United States 127,026; United Kingdom 36,807.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 83	28	NA.

r Revised. NA Not available.

[1] Includes some manufactures, not separable from unwrought and semimanufactures in source.

[2] Quantities not available; values reported at the following conversion rates: 1973, R1.4441=US\$1.00; 1974, R1.4722=US\$1.00.

[3] Less than ½ unit.

[4] Imports of crude oil are not officially reported, but are known to be substantial; estimated levels, in thousand 42-gallon barrels, are as follows: 1973—99,937; 1974—93,871.

Table 4.—Republic of South Africa: Value of domestic sales and exports of major mineral commodities

(Thousand dollars)

Commodity	Domestic sales		Exports	
	1974	1975	1974	1975
METALS				
Antimony	161	15,226	28,417	15,208
Chromium ore	7,089	16,701	21,890	39,090
Copper	126,167	75,319	202,243	124,581
Gold [1]	--	--	3,853,745	3,498,268
Iron ore	22,769	25,848	r 28,909	31,693
Manganese ore	16,427	22,990	98,707	116,446
Nickel	19,041	12,204	50,682	71,991
Silver [1]	--	--	r 12,074	13,680
Tin	7,030	5,999	10,481	11,373
Vanadium	393	--	39,532	51,921
Zinc	5,309	7,654	6,806	12,685
Zirconium	589	326	2,110	1,577
NONMETALS				
Andalusite	1,455	2,482	1,149	1,696
Asbestos	4,026	6,471	75,720	118,603
Diamonds [1]	--	--	r 210,296	238,039
Other gems	112	241	759	601
Feldspar	1,158	1,408	169	165
Fluorspar	868	1,481	6,816	9,194
Gypsum	2,366	2,178	194	238
Kaolin	934	1,476	40	17
Other clays	3,805	5,614	6,130	5,283
Limestone	24,854	27,240	884	1,070
Lime products	r 17,009	24,967	--	--
Magnesite	1,454	2,218	--	--
Mica	94	109	582	422
Phosphate	24,402	33,552	1,010	350
Pyrite	5,643	6,926	--	--
Salt	r 6,822	8,171	231	222
Shale	603	501	--	--
Silica	6,372	8,602	209	82
Sillimanite	1	39	1,592	1,445
Slate	2,191	1,845	498	419
Stone	1,051	2,167	15,042	12,112
Talc	418	385	16	8
Vermiculite	176	218	5,593	7,732
Wonderstone	324	679	754	515
MINERAL FUELS				
Anthracite	7,448	13,223	16,452	24,846
Bituminous coal	254,886	367,681	15,385	26,186
MISCELLANEOUS				
Other minerals [2]	89,366	110,786	400,840	398,797
Total	r 662,813	812,927	r 5,115,957	4,836,555

r Revised.
[1] Total value, including domestic sales, if any.
[2] Includes platinum and uranium.

Source: Republic of South Africa, Department of Mines. Quarterly Information Circular. October–December 1975, pp. 1–2 and 29–32.

COMMODITY REVIEW

METALS

Aluminum.—Production of aluminum metal increased slightly at the Richards Bay reduction plant operated by Alusaf (Pty.) Ltd., the Republic's only aluminum producer. Most of the raw material was imported as alumina from the Gove plant in Australia, operated by Swiss Aluminium Ltd. (Alusuisse) which owns 22% of Alusaf. Local sales accounted for more than 53,000 tons of this production, and nearly 15,000 tons was exported. Slightly more than 12,000 tons of manufactured and semimanufactured aluminum products reportedly was imported. In February 1975, Hullets Aluminium Ltd. announced that improvements to its 40,000-ton-per-year cold strip mill at Maritzburg should be completed by March 1977. Costs were estimated at $27 million, and decreased operating costs with better quality control was the primary objective. Small amounts of alumina, as well as calcined and activated bauxite, were imported for the manufacture of chemicals, abrasives, and refractories.

Antimony.—All antimony production came from the Murchison range, northwest of Phalaborwa in northeastern Transvaal. Consolidated Murchison Ltd. (CML) continued operations at its Gravelotte, Monarch, United Jack, Weigel, Free State, and Mulati mines, and commenced hoisting at the newly equipped 50,000-ton-per-month Athens shaft. Ore production was reported at about 637,000 tons, 2.5% higher than in 1974, but the grade declined from slightly above to below 3% antimony content. Local sales of concentrates increased from 122 tons in 1974 to nearly 12,000 tons in 1975, with a corresponding decrease in exports. Antimony Products (Pty.) Ltd., a joint venture of Chemtron Corp. (Chicago), CML, and Johannesburg Consolidated Investment Co., Ltd. (JCI), was responsible for the increase in local sales. Its new plant at Gravelotte extracted the antimony as crude oxide and manufactured a fire retardant, most of which was exported. Exports of antimony concentrates were slack during the first 9 months of 1975, averaging less than 600 tons per month, but increased substantially to an average of nearly 2,300 tons per month during the final quarter of the year. The increase was apparently due to an accelerated demand for antimony-based fire-retardant insulating material needed by U.S. manufacturers to comply with legislation which became effective in September 1975, requiring the use of flameproof material in cabinets of television sets.

CML continued exploration along the Murchison range and reported the discovery of a new ore body in November 1975. Location, size, and grade of this ore body were not revealed.

Chromite.—Production of chromite in 1975 increased 11% to more than 2 million tons, and increases of 32% and 16% were reported for domestic sales and export tonnages, respectively. The rand value of local sales increased 170% to more than R10 million, and the U.S. dollar value of exports increased 79% to almost $28 million. Production of chrome sand increased 26% to more than 500,000 tons. Increased foundry demand was largely responsible for a 31% increase in domestic sales and higher prices accounted for a 92% increase in sales value to nearly R2 million ($2.7 million). Sand exports increased 21% and their value, 78%, to $11.2 million in 1975 compared with $6.3 million in 1974.

In July 1975, the General Mining and Finance Corp. Ltd., which owned some of the country's 15 major chromite producers, announced negotiations with the Frelimo Government of Mozambique for improvements at the port of Maputo (formerly Lourenço Marques). The firm proposed to invest more than $4.5 million in railway improvements, construction of a new ore dock, chromite loading facilities, modern stockpile reclaimers, multiple conveyors, and facilities for harbor dredging so that 60,000-ton ore carriers could be loaded completely instead of having to be "topped up" from barges.

Copper.—The 1975 production of copper ore, concentrates, and metal were at essentially the same levels as those recorded during 1974. Owing to the prevailing low price on world markets, export volumes and sales were down 18% and 34%, respectively, while imports were drastically curtailed, 86% in volume and 93% in value. The tonnage sold domestically increased 3% but its value decreased 36%, reflecting the decline in world copper prices.

Virtually all of the Republic's copper was produced by four companies. Adverse market conditions caused the shutdown of two underground mines and one concentrator operated by the O'okiep Copper Co. Ltd. at its massive sulfide deposits near Springbok in northwestern Cape Province, nearly 500 kilometers north of Cape Town. Massive deposits of complex sulfide ore were extracted by underground methods from underground mines operated by Prieska Copper Mines (Pty.) Ltd. (PCM), about 500 kilometers east of Springbok. Copper, zinc, lead, and pyrite (for sulfuric acid) concentrates were recovered by PCM's mill. Erratically distributed copper sulfide ore bodies in veins were extracted from underground mines near the Southern Rhodesian border in the northern Transvaal by the Messina (Transvaal) Development Co., Ltd. More than 1 million tons of ore was milled and the resulting concentrates produced more than 10,000 tons of copper. A ring complex near the town of Phalaborwa, 170 kilometers southeast of Messina, was the site of an open pit copper mine owned by Palabora Mining Co. Ltd. (PMC). A vermiculite-rich outer ring surrounds an intermediate ring of magnetite-apatite rock, enclosing an inner core of carbonatite which contains copper sulfides disseminated throughout at an average ore grade range of 0.50% to 0.65% copper.

In 1975, PMC continued to increase the capacity of the country's largest single mining complex at Palabora. Heavy equipment moved 56.7 million tons of material from the pit, including 19.5 million tons of ore averaging 0.56% copper, to the concentrator. The smelter produced nearly 92,000 tons of anode copper from Palabora ore, and more than 13,700 tons of anodes from concentrates purchased or treated on a toll basis for smaller producers. Byproducts, including apatite (for phosphate), vermiculite, magnetite, and minerals containing nickel, uranium, zirconium, and precious metals, were also recovered and contributed to the successful operation of the plant during a year of low copper prices.

Proved recoverable copper ore reserves were reestimated as shown in the following tabulation:

Area	Quantity (million metric tons)	Percent copper
O'okiep	27	1.62
Prieska	48	1.74
Messina	5	1.40
Palabora	300	.60
Total and average	380	.83

Exploration and development of cupriferous and multimetal deposits has continued with encouraging results in the northwestern part of the Cape Province. Reportedly, Union Corporation (with O'okiep-Newmont Mining Corporation) has intensified assessment of a 90-million-ton copper-lead-zinc ore body near Gamsberg, about 100 kilometers northeast of Springbok. Nearby, at Phelps Dodge Corp.'s Broken Hill and Black Mountain holdings, sufficient copper-lead-zinc ore has been delineated for feasibility studies. Reserves at Broken Hill reportedly may exceed 79 million tons averaging 0.38% copper, 4.28% lead, 2.32% zinc, and 1.7 troy ounces silver per ton; about 40 million tons would be recoverable by open pit methods. The Black Mountain ore body was stated to include 30 million tons averaging 0.60% copper, 2.30% lead, 0.50% zinc, and 0.73 troy ounce silver per ton. Most of this tonnage was considered as amenable to open pit mining, and an additional 56 million tons might be recoverable by underground methods. JCI was also investigating a copper-zinc find in the same vicinity. Rio Tinto-Zinc Corporation Ltd. has reported the prospect of about 100 million tons of 1.0% copper ore in the Haib River area, northwest of Springbok. Development of these properties was deferred because of depressed world economic conditions, which was also the reason for a second postponement of the 120,000-ton-per-year copper refinery by O'okiep and Tsumeb Corp. Ltd., for construction near Cape Town.

Gold.—The Republic's gold industry recorded a profitable year in 1975. Working revenue increased slightly in terms of the South African rand despite a 6% drop in the grade of ore milled, a slight decrease in the volume of ore milled, and a 27% increase in operating costs (in part due to a general increase in miners' wages effective July 1, 1975). The highest free market gold price in 1975 was $185.50 per troy ounce at the end of February, compared with that of 1974 at $195.50 per troy ounce. The average price of gold for 1975 was $162.25 per troy ounce, an increase of nearly 2% over the $159.62 average price for 1974.

Major gold mines of the Witwatersrand produced 22,497,083 troy ounces; the Barberton mines to the northeast produced 47,133 troy ounces; and 393,634 troy ounces came from small mines or was produced as byproduct from base metal ores. Production for 1974 and 1975 with proven reserves of the various mines or companies are shown in table 5.

The output of some of the country's smaller mines was custom-smelted, but most of the gold mines processed their own ores into bars weighing about 840 troy ounces (26 kilograms). These bars, which contained approximately 88% gold, 10% silver, and 2% base metals, were shipped to the Rand Refinery, Germiston, which had an annual capacity of 1,000 tons of gold and 100 tons of silver. Rand Refinery products included 996-fine gold for coinage, 999-fine gold for industry and the arts, and electrolytically refined silver and platinum-group metals. The refined gold was cast into ingots weighing about 400 troy ounces (12.5 kilograms) which were cleaned, check-weighed, and marked to meet international bullion market specifications. The entire gold output was sold to the South African Government's Reserve Bank on a daily basis. Payments to the producing mines were made immediately following receipt of the bullion, based on the world market price of gold on the day received. The average total elapsed time, mine to Reserve Bank, was 5 days.

Following the December 1974 accord between the United States and France, market economy countries recognized that central banks should be allowed to value their gold holdings at market prices if they so wish. The South African Reserve Bank made no change in its official price of R29.7 per troy ounce of fine gold throughout 1975. Domestic producers received the official price plus additional revenue depending on the world price.

Sales abroad were handled by the International Gold Corporation Ltd. (Intergold), which conducted promotional activities with manufacturers, wholesalers, and retailers of gold products (including jewelry and watches) throughout the world. Intergold also launched a successful advertising campaign for overseas sales of the Krugerrand which contained 1 troy ounce of gold. Sales of this coin were heaviest in the United Kingdom early in the year until a ban on imports of gold coins for resale was imposed by the British Chancellor of the Exchequer on April 15. Subsequently, West Germany became the largest buyer. Total overseas sales of Krugerrands amounted to about 4.7 million coins in 1975, a 56% increase over the 1974 sales of slightly more than 3.0 million coins. Sales of gold R2 coins were resumed toward yearend 1975 and about 108,000 were sold to distributors in West Germany and Switzerland at a higher premium than that commanded by the Krugerrand.

Iron and Steel.—The demand for iron ore and steel products continued to show gains in every category during 1975 although exports of pig iron and steel manufactures declined slightly toward yearend. Construction of ISCOR's 861-kilometer railway from the new open pit mine at Sishen to Saldanha Bay was nearly complete, and commissioning of ore-loading facilities was progressing as scheduled. Shipment of magnetite ore through the Indian Ocean port of Maputo was interrupted and exports of iron ore to Japan (the country's major customer) declined 26% from about 2.2 million tons in 1974 to little more than 1.6 million tons in 1975.

Iron Ore and Concentrate.—Production of hematite ore increased 8.5% from more than 8.6 million tons to nearly 9.4 million tons, but magnetite production remained at about 2.9 million tons. Local sales of hematite increased 17.7% from nearly 6 million tons to more than 7 million tons, and magnetite sales increased nearly 36% from 0.9 million tons to nearly 1.2 million tons. ISCOR continued to be the country's leading producer and consumer of iron ore, with most of its 6.5 million tons extracted from its old Sishen mine in the northern part of Cape Province. The firm's Thabazimbi mine in northern Transvaal Province produced 2.1 million tons of ore and its three steel mills consumed 6.2 million tons of its total production.

Production of magnetite ore by the Highveld Steel and Vanadium Corp. Ltd. increased about 8% from less than 2.2

Table 5.—Republic of South Africa: Gold production and ore reserves, by producer

Producer	Production (troy ounces)		Developed ore [1]	
	1974 r	1975	(thousand metric tons)	(troy ounces per metric ton)
Barberton	43,820	47,133	NA	NA
Blyvooruitzicht	943,490	842,581	5,528	0.765
Bracken	271,307	259,437	1,700	.322
Buffelsfontein	1,017,689	942,158	6,668	.472
City Deep, Consolidated Main Reef, Crown Mines	156,452	127,146	NA	NA
Doornfontein	548,524	440,076	2,154	.485
Durban Deep	263,813	229,656	2,747	.203
East Daggafontein	76,562	57,637	NA	NA
East Driefontein	609,718	822,329	2,924	.977
East Rand Proprietary Mine Ltd	430,177	366,136	5,160	.267
Elsburg	163,001	--	NA	NA
Freddies Consolidated	299,310	141,466	1,597	.369
Free State Geduld	1,249,500	1,215,423	6,564	.682
Free State Saaiplaas	166,810	157,992	2,390	.213
Grootvlei	174,147	165,303	5,700	.136
Harmony	986,266	989,857	17,445	.298
Hartebeestfontein	1,079,079	1,046,838	10,519	.431
Kinross	359,209	354,118	6,500	.315
Kloof	681,252	487,158	3,541	.534
Leslie	238,270	182,790	3,000	.231
Libanon	458,973	342,810	3,845	.356
Loraine	308,962	252,917	8,519	.307
Marievale	152,770	128,121	1,400	.164
President Brand	1,316,665	1,289,981	8,130	.493
President Steyn	994,374	869,067	9,049	.423
Randfontein	180,734	374,672	1,211	.476
St. Helena	834,736	812,784	11,000	.466
South African Land and Exploration Co., Ltd	178,812	165,136	886	.366
Stilfontein	508,311	470,590	4,155	.407
Vaal Reefs	2,084,403	1,973,843	15,191	.466
Venterspost	300,053	233,331	6,673	.230
Vlakfontein	126,131	105,760	344	.289
Welkom	458,848	437,565	5,500	.365
West Driefontein	2,277,545	1,908,372	6,200	.838
Western Areas	632,969	725,983	9,285	.251
Western Deep Levels	1,546,994	1,534,748	5,348	.629
Western Holdings	1,268,851	1,324,820	8,934	.626
West Rand Consolidated	239,058	204,514	1,332	.252
Winkelhaak	491,921	477,766	7,800	.299
Witwatersrand Nigel Ltd	39,001	36,202	758	.254
Other	229,164	393,634	NA	NA
Total	24,387,671	22,937,850	199,697	.414

r Revised. NA Not available.
[1] Fully developed and blocked-out ore only; calculated at January 1, 1976, price of gold and at current operating costs. Additional indicated and inferred (possible) reserves are not included.

million tons to more than 2.3 million tons in 1975. Magnetite production at the Palabora mine was interrupted for 4 months because of rail car shortages and shipping delays at the Mozambique port of Maputo which resulted in a 21% decline in production.

In September 1975, the Anglo-Transvaal Consolidated Investment Co. Ltd. (Anglovaal) announced that its Associated Manganese Mines of South Africa Ltd. (AMM) had signed an agreement to supply 3 million tons per year of iron ore to the United States Steel Corp. from AMM's open pit mine in Northern Cape Province. United States Steel had subscribed to 355,000 shares of Anglovaal stock at a cost of more than $10 million and was to loan AMM about $6 million to finance expansion of iron ore production.

Iron and Steel Products.—All categories of iron and steel products registered gains in 1975. Production of pig iron increased 12%, ingots 13%, iron castings and ferroalloys 17% each, and steel castings 5%. Manufacturing and fabricating industries had a generally productive year as indicated by the 8% increase in sales of steel semimanufactures. Exports remained relatively steady and imports were curtailed. By October 1975 stocks of coil, hot- and cold-rolled sheet, and light plates were reported to be accumulating due to decreased demand for appliances and automobiles.

ISCOR's new open pit mine at Sishen began production in November, the railway to Saldanha was nearing completion, and ore storage and loading facilities at Saldanha were expected to be operational during 1976. Provision was made for increasing the ore export capacity of the port from 7 million tons to 20 million tons per year. Construction of a steel mill at the port was also contemplated. At ISCOR's Newcastle steel plant in Natal, installation was completed on the last of three 150-ton Linz-Donawitz (LD) steel furnaces, a third 40,000-ton-per-month continuous bloom-casting machine, a 45,000-ton-per-month bar mill, a 27,500-ton-per-month rod mill, and a 7,000-ton-per-month wire drawing and galvanizing machine. Under construction were additional coke ovens, a new blast furnace, and a continuous slab-casting machine. Expansion and improvements were also continuing at the firm's Pretoria and Vanderbijlpark works in the Transvaal.

Ferroalloys.—In mid-1975, construction of three electric furnaces at a new plant to produce 120,000 tons of high-carbon ferrochrome per year commenced by Fraser and Chalmers (SA) (Pty.) Ltd. for Tubatse Ferrochrome Ltd. General Mining held 51% of this newly formed company, which was managed by Union Carbide Corp., the minority shareholder. General Mining was to supply the ore from its newly acquired Chrome Mines of South Africa Ltd. The total output from Tubatse was to be exported. Early in 1975, JCI confirmed that a member of the JCI group, Consolidated Metallurgical Industries Ltd., had been given approval to construct a 120,000-ton-per-year ferrochrome plant at Lydenburg in the eastern Transvaal. South African Manganese Amcor Limited (SAMANCOR) (formerly South African Manganese Limited) acquired two mines in the western Transvaal, Grasvally Chrome mine and Union Carbide's Ruighoek Chrome mine, as well as the plant of Ferrometals Ltd. at Witbank in the central Transvaal. The capacity of the two chrome mines was 180,000 tons and was expected to more than double by 1980. SAMANCOR was the country's fourth largest chromite producer in 1975 and, with its new public sector ties, anticipated becoming the country's principal exporter of ferroalloys. Future annual production was estimated to include some ferrovanadium, 150,000 tons each of ferrochrome and ferromanganese, and 45,000 tons of ferrosilicon.

Reported production of ferroalloys is shown in the following tabulation, in tons:

	1974	1975
Ferrochrome	184,398	216,830
Ferromanganese	362,534	425,890
Ferrosilicon	89,068	104,580
Ferrovanadium	200	300
Total	636,200	747,600

Manganese.—The Republic of South Africa was the world's second largest producer of manganese ore (after the U.S.S.R.), and the largest exporter among market economies. The most important deposits were developed some 50 kilometers south and 60 to 100 kilometers north of Sishen in the Cape Province. Large deposits were also exploited west of Johannesburg in the Transvaal. Proved reserves in these areas exceeded 1 billion tons, and resources were estimated at more than 10 billion tons. Total production of all ore grades was nearly 5.8 million tons, 22% more than in 1974. Metallurgical grades accounted for nearly 5.7 million tons. Local sales increased 63% to more than 1.6 million tons and exports increased 16% to more than 3.6 million tons. With an increased price in the world market, manganese ore provided some $140 million in foreign exchange, about 46% more than in 1974.

SAMANCOR continued as the country's leading manganese producer, with nearly 3.8 million tons of ore, or 65% of total output during the year. This company acquired all of Amcor Limited's operating subsidiaries during 1975. Amcor was wholly owned by ISCOR and has become a nonoperational company, holding 45% equity in SAMANCOR. The principal assets acquired from Amcor included the Grasvally Chrome mine and Ferrometals Ltd., a ferrochrome producer at Witbank, Transvaal. SAMANCOR also acquired Union Carbide's Ruighoek Chrome mine (also in the Transvaal). SAMANCOR operated the Wessels mine, the largest underground manganese mine in the world, and three open pits—

Hotazel, Mamatwan, and Lohathla. A second inclined shaft and an increased crushing and sizing plant were expected to double Wessel's production to 500,000 tons per year. SAMANCOR produced ferromanganese and exported more than 2 million tons of ore which was carried by rail to Port Elizabeth, 800 kilometers to the southeast. AMM was the country's second largest manganese producer with nearly 2 million tons of ore in 1975.

Nickel.—All nickel production was a byproduct of the country's platinum mining operations. Ores from the norite zone of the Merensky Reef in the Bushveld Igneous Complex of the northern Transvaal were reported to contain about 0.2% nickel, which was recovered from the refining of nickel-copper matte. Between 55 and 100 troy ounces of platinum-group metals was produced per ton of nickel. Production of nickel during 1975 declined 6% to 20,754 tons. The apparent volume and reported value of local sales declined 40% and 31%, respectively, and exports continued to increase 24% in volume and a reported 53% in value during 1975.

Platinum-group Metals.—The Republic of South Africa remained the world's leading producer of platinum-group metals during 1975. The four platinum producing companies treated nearly 13.4 million tons of ore to produce more than 2.6 million troy ounces of platinum-group metals, a decrease of about 7.5% from the 2.8 million troy ounces reported in 1974. Approximately 1.6 million troy ounces of platinum metal was recovered, compared with more than 1.2 million troy ounces in 1974. The remaining production included osmiridium recovered from gold ores.

Platinum was discovered during 1923 as a minor constituent of a thin layer or zone of pyroxenitic norite with chromite and sulfides in the Bushveld Igneous Complex. This zone, later named the Merensky Reef, had an average thickness of about 0.7 meter (28 inches) but was traceable along a strike length of nearly 500 kilometers around the Complex. The reef dipped at about 9° toward the center of the Complex to a depth of more than 1,000 meters. Platinum-group metals (platinoids) were present in their metallic state and as complex sulfide minerals associated with sulfides of copper, nickel, and iron (chalcopyrite, pentlandite, and pyrrhotite). A narrow band of chromite-rich rock often occurred at the base of the reef, and this mineral, as well as nickel and copper, was recovered as byproduct.

Rustenberg Platinum Mines Ltd. had started a major expansion program which was deferred in 1975 except for the introduction of longwall mining with downdip scraper recovery. This has increased mining speed and recovery, reduced the number of miners required, and introduced better mechanized methods of extraction. Anglovaal announced that its research staff has developed a revolutionary new refining process which reduced refining time and cost by recovering palladium before platinum.

Tin.—The output of tin concentrate during 1975 increased 10% to 5,652 tons, but the metal content was lower, averaging 46.1% tin compared with 48.1% in 1974. Production of tin metal declined from 854 tons in 1974 to 780 tons in 1975.

Uranium.—The uranium oxide mineral uraninite was recovered as a byproduct from the gold ores of the extensive Witwatersrand deposits. Smaller amounts were recovered from the cupriferous carbonatite ore at Palabora. Production of U_3O_8 from gold ores declined about 8% from 3,074 tons in 1974 to 2,809 tons in 1975. Production from Palabora increased from 124 tons to 125 tons. Only 8 of more than 40 Witwatersrand gold mines produced uranium in 1975 but a number of others were prepared for uranium recovery when market conditions improved. West Rand Consolidated planned to produce nearly 500 tons of U_3O_8 from its recommissioned plant during 1976 and subsequent years. Anglo-American's plant at Welkom was nearing completion, and by 1976 was scheduled to re-treat waste products from its West Rand mines for an annual production of about 600 tons of U_3O_8 as well as a substantial amount of pyrite for sulfuric acid. A similar plant was expected to recover about 360 tons of U_3O_8 annually from waste dumps at its East Rand mines.

In November 1975, the Minister of Mines announced that the Government would construct a full-scale uranium enrichment plant based on the new and confidential process developed by the Uranium Enrichment Corp. (UCOR) in 1974. The process was to use uranium hexafluoride gas as feedstock, was reportedly aerodynamic, and was of the same basic type as the jet nozzle process developed in West Germany. The Government announcement noted that while UCOR's pilot uranium plant (at a cost of approximately $105 million) had been successful in every respect, studies to determine the size and site of the proposed 5,000-ton-per-year production plant were continuing. UCOR estimated the cost of the unit to be $1.0 billion to $1.5 billion and that the enrichment of the more highly fissionable U–235 from 0.7% to 3.5% at the expense of U–238 will be 20% cheaper than other known full-scale methods.

Vanadium.—More than half of the vanadium produced by market economy countries was produced by the Republic of South Africa from reserves reported to exceed 232 million tons containing from 1.5% to 2.0% V_2O_5 and calculated to a mining depth of about 30 meters. The principal source was the prolific Bushveld Ingenous Complex near Lydenburg and elsewhere in the northern Transvaal. Concentrations with as much as 2.4% V_2O_5 occurred in titaniferous magnetite ore but the average content of the normal open pit product was between 1.0% and 1.6% V_2O_5. The mined ore was leached to produce ammonium vanadate which was converted to the oxide form. Statistics published by the South African Department of Mines combined the V_2O_5 content of several products—pentoxide, ferrovanadium, metavanadate, and slag—indicating about 19,000 tons in 1975, 31% more than the 14,600 tons reported for 1974.

The country's largest vanadium company (and the leading world producer of this commodity), Highveld Steel and Vanadium Corp., Ltd. (HSV), was operating at an installed capacity reported to be 12,000 tons of vanadium pentoxide per year. HSV's ore originated from the Steelpoort Roosenekal area of the Transvaal and was treated at Witbank. The country's second most important producer, Ucar Minerals Corp. (Union Carbide, S.A., Ltd.), obtained its ore from the Brits area and processed it at Bon Accord near Pretoria (installed capacity 2,000 tons of vanadium pentoxide annually).

A third group entered the South African vanadium scene in 1974—Otavi Mining Co. Ltd. Otavi's output was to have been limited initially to 1,500 tons of vanadium pentoxide per year, though reportedly the firm will expand its operations within a 5-year period if export sales, mainly to Japan's Taiyo Koko company and to West Germany, improve. Otavi's mine (operated by Transvaal Alloys (Pty.), Ltd.) and plant were located at Wapadskloof, about 65 miles northeast of Middelburg (Transvaal).

Zinc.—The Republic of South Africa's zinc was produced by PCM from its operation 50 miles west of Prieska in the east-central part of Cape Province. The PCM concentrator, uprated from 2.6 million tons to 3.7 million tons of ore milled, achieved full capacity in 1975. It produced nearly 128,000 tons of zinc concentrate, 88% more than the 68,000 tons produced in 1974, at a grade of more than 51% zinc. Approximately 100,000 tons of copper concentrate at 25% copper, 5,000 tons of lead concentrate, and, for the first time, 75,000 tons of pyrite concentrate were also produced in 1975. The zinc concentrate was sold to the Zinc Corp. of South Africa (ZINCOR), a subsidiary of Gold Fields of South Africa, Ltd., which produced some 64,000 tons of electrolytically-refined zinc in 1975, despite a rectifier breakdown during the last quarter of the year. With the impending development of copper-lead-zinc ore bodies in the northwestern part of Cape Province and the reported discovery of additional deposits, the country's zinc supply was apparently assured.

NONMETALS

Asbestos.—Production, domestic sales, and exports of asbestos continued to increase during 1975. Production totaled nearly 355,000 tons compared with about 333,000 tons in 1974. Local sales increased from approximately 21,000 tons to more than 30,000 tons, and exports rose 69% to more than 544,000 tons from nearly 322,000 tons reported in 1974. Part of the increased demand for South African asbestos was due to a protracted strike by mineworkers in Canada during 1975. South African stockpiles were reduced and exports exceeded mine output by as much as 56% in terms of Cape Blue crocidolite. Imports of asbestos products declined from more than 30,000 tons in 1974 to about 28,500 tons in 1975 (approximately 9% of production).

Cement and Limestone.—Cement production and sales declined slightly to approximately 7.2 million tons and 6.8 million tons, respectively, in 1975. Imports declined 17% to about 70,000 tons. Shortages of rail cars forced a cutback in plant output so that the industry's extended capacity was not reached. Pretoria Portland Cement Co. Ltd., which supplied nearly half of the domestic requirements, stopped all further plant expansion until local market conditions improved. Anglo-Alpha Cement Ltd. expressed agreement with this policy.

The production of limestone increased marginally to 16.6 million tons, but local sales declined 8% while their value increased 18% in 1975. The increase in price, coupled with diminished demand from the cement industry, resulted in a stockpile increase of 84% from nearly 3.4 million tons to more than 6.2 million tons by yearend 1975. Approximately 14%, or about 2.3 million tons, of the limestone production was converted into nearly 1.3 million tons of lime, an increase of 11% over the amount produced in 1974. Most of the lime was sold to local consumers, but 13,300 tons was exported, an increase of 32% in quantity and 70% in value over the amounts reported in 1974.

Diamond.—Although diamond production in the Republic of South Africa decreased marginally in 1975, the volume and local value of diamond sales increased 13% and 22%, respectively, compared with 1974 levels. Renewed consumer demand for gem diamonds developed early in the year and sales of larger stones had reportedly improved by yearend 1975. Production of diamond in 1975 totaled 7.3 million carats compared with more than 7.5 million carats in 1974. Sales increased to more than 8.0 million carats from nearly 7.1 million carats in 1974. The Finsch mine near Kimberly in the Cape Province and the Premier mine near Pretoria in the Transvaal have each produced more than 2 million carats annually. Some idea of the relative abundance of gem and industrial diamond may be inferred from table 6.

All rough diamond produced in the Republic of South Africa was sold through the industry's Diamond Producers Association to De Beers' Central Selling Organization. Mine operators who were not members of the Diamond Producers Association sold their output under contract to De Beers or an associated company. The Central Selling Organization controlled external sales of South African diamond production and reportedly marketed about 80% of the world's diamond per year.

Fluorspar.—In 1975, acid-grade fluorspar, containing 97% or more CaF_2, accounted for about 172,000 tons or about 85% of the Republic's total production of nearly 203,000 tons. Nearly all of the fluorspar exported was this type. Ceramic-grade fluorspar, with 85% to 96% CaF_2, amounted to 5% of the total output, and metallurgical grades contributed barely 20,000 tons or about 10% of this commodity. Production of metallurgical and chemical grades of beneficiated fluorspar increased 113% and 106%, respectively, above 1974 levels, but output of acid-grade

Table 6.—Republic of South Africa: Diamond sales, by province

Province	1974		1975	
	Sales (metric carats)	Average price (rands per carat)	Sales (metric carats)	Average price (rands per carat)
MINE DIAMOND				
Transvaal	2,456,043	6.24	2,413,380	7.16
Cape Province	3,182,827	15.09	3,771,586	16.55
Orange Free State	327,949	31.27	470,087	28.02
Total	5,966,819	12.34	6,655,053	13.95
ALLUVIAL DIAMOND				
Transvaal	16,760	80.12	12,590	71.78
Cape Province	1,087,737	62.51	1,344,897	59.82
Orange Free State	118	107.84	91	68.41
Total	1,104,615	62.78	1,357,578	59.92
Grand total	7,071,434	20.22	8,012,631	21.74

material declined 11%. Domestic requirements for flux in the iron, steel, and ferroalloy industries and for glass and ceramic glazes accounted for increases of 85% and 101%, respectively, in volumes of local sales during 1975. Local demand for acid-grade fluorspar declined 18%, but exports increased 13% to about 126,000 tons.

The South African Government's Department of Mines listed Marico Fluorspar (Pty.) Ltd. at Zeerust, Transvaal, as one of seven producers of record during 1975. This new subsidiary of United States Steel was scheduled to commence mining by yearend, with full-scale mine and beneficiation plant to operate at an annual capacity of 120,000 tons of acid-grade and 50,000 tons of metallurgical-grade fluorspar concentrates during 1976. All of Marico's output was to be exported to the United States and to consumers in West Europe. Ottoshoop Holdings (Pty.) Ltd. also was listed as a 1975 producer. Its property, also near Zeerust, was purchased in 1973 by Chemspar, Inc., a subsidiary of Phelps Dodge Corp. The plant was rehabilitated and brought into production in 1974 with a rated capacity of 30,000 tons of acid-grade fluorspar per year.

Phosphate.—Production of phosphate ores increased from 7.8 million tons in 1974 to 11.6 million tons in 1975. Virtually all of the ores and concentrates were sold locally for the production of phosphoric acid and superphosphate fertilizers. The P_2O_5 content of concentrates sold locally increased from 1.3 million tons in 1974 to more than 1.5 million tons in 1975 and the value rose from $23.4 million in 1974 to nearly $32.2 million in 1975. Crushed ore from Gold Field's Glendover mine, north of Thabazimbi in the Transvaal, was sold to SAMANCOR. Production was more than 94,000 tons containing 30% P_2O_5, compared with about 79,000 tons of the same grade sold in 1974. The Phosphate Development Corp. Ltd. (FOSKOR) continued open pit mining on the apatite-rich ring surrounding the Palabora carbonatite. The 11.6 million tons of ore reported as production included some apatite-rich overburden removed from the neighboring PMC's open pit, as well as ore from FOSKOR's pit. FOSKOR's concentrator treated part of its own ore but also treated phosphate-rich tailings pumped directly from PMC's copper concentrator. Additional capacity at the FOSKOR concentrator was scheduled for 1976.

Pyrite.—*Sulfuric Acid.*—Iron pyrite concentrate was produced as a byproduct at several South African gold mines and from the PCM copper-zinc-lead mine west of Prieska. Nearly 651,000 tons was produced in 1975, a 14% increase over the 1974 output. The sulfur content of concentrates sold locally amounted to more than 218,000 tons worth about $6.9 million in 1975, compared with over 215,000 tons worth more than $5.6 million in 1974. Recovery of pyrite from waste dumps on the Witwatersrand was increased in order to provide more sulfuric acid for the phosphate fertilizer industry.

Vermiculite.—Byproduct vermiculite production from PMC's open pit at Palabora increased 14% from nearly 183,000 tons in 1974 to more than 207,000 tons in 1975. Local sales increased 17% from nearly 6,000 tons to almost 7,000 tons, and the volume and value of exports rose 24% and 38%, respectively, from about 150,000 tons and almost $5.6 million in 1974 to 186,000 tons and more than $7.7 million in 1975.

MINERAL FUELS

Coal.—Extensive coal deposits provided most of the country's energy requirements, and exports of surplus coal earned about $51 million in foreign exchange during 1975. Production of anthracite coal increased from about 1.4 million tons to 1.6 million tons during 1975 and bituminous coal output rose from 64.6 million tons to 67.8 million tons. Increases recorded in production, local sales, and exports, in thousand tons and thousand dollars, are shown in the following tabulation:

	1974		1975	
	Quantity	Value	Quantity	Value
Coal, all types:				
Production	66,056	NA	69,440	NA
Local sales	62,354	$262,334	66,434	$380,904
Exports	2,277	31,837	2,687	46,933
Bituminous and subbituminous:				
Production	64,621	NA	67,849	NA
Local sales	61,771	254,886	65,732	367,681
Exports	1,242	15,385	1,565	26,186
Anthracite:				
Production	1,435	NA	1,591	NA
Local sales	583	7,448	701	13,223
Exports	1,035	16,452	1,122	24,846

NA Not available.

Bituminous and subbituminous coal accounted for 99% of domestic sales but only 58% of export sales. About 42% of the coal exported consisted of more than 1.1 million tons of Natal anthracite. Of the domestically consumed coal, 37.6 million tons was used to generate electricity, 13% to produce coke, 11% by local industries, 6% for household consumption, 3% (nearly 2 million tons) each to coal gas producers and for the oil-from-coal project, 2% each to other gas producers, for consumption at coal mines, and for transport, and 1% for other mining industries.

On December 5, 1974, the Government announced that the South African Coal, Oil, and Gas Corp. Ltd. (SASOL) was planning the construction of a second and larger oil-from-coal conversion plant, SASOL II, with a U.S. firm, Fluor Corp., as general contractor. By May 1975, the cost of the project was estimated at $1.6 billion, and by yearend the estimate had escalated to $2.2 billion. Controversy over the practicality of the plan had continued since its announcement and at yearend detailed studies were still in progress.

Petroleum.—All of the Republic's oil supply was imported and most of it was refined within the country. Imports of crude oil increased from nearly 94 million barrels in 1974 to more than 122.5 million barrels in 1975.

Exploration for oil was scheduled to continue both onshore and offshore during 1975, under the direction of the Southern Oil Exploration Corp. (Pty.) Ltd. (SOEKOR). Seven wildcat holes with a combined depth of about 37,000 feet were reportedly drilled in 1975, compared with the 14,000 feet completed in five wildcat holes during 1974. A drilling rig operating in the St. Lucia area, 240 kilometers north of Durban, was reported to have encountered troublesome rock but no sign of either gas or oil.

The Mineral Industry of Southern Rhodesia

By Janice L. W. Jolly [1]

Mineral production in Southern Rhodesia contributed about 6.9% to the gross domestic product (GDP) of $3,055 million[2] in 1975 at current prices, compared with 7.2% of the 1974 GDP.[3] The economy recorded a 7.7% growth rate in current dollars during 1975, versus 9.6% in 1974. In the first 10 months of 1975, the rate of inflation averaged 7.8%. The Rhodesian dollar was devalued relative to the U.S. dollar in September 1975. The increases in fuel and freight rates were expected to add further to inflationary trends. With no significant recovery in copper, nickel, iron ore, or chrome prices expected before 1976, foreign exchange remained tight.

The fall in world mineral prices and demand resulted in a reduction in the value of mineral production for the first half of 1975. Mining production recovered during the second half of 1975, however, and increased 39% in the first 2 months of 1976. Southern Rhodesia's fourth nickel mine was opened in October 1975 with production expected to reach full capacity by early 1976. Growth recorded for both mining and agriculture offset a decline in manufacturing production. Southern Rhodesia was making preparations for alternative transport routes in the event of Mozambique border closures. Rhodesian Railways Co. was increasing the capacity of the Rutenga-Beitbridge line to the Republic of South Africa in anticipation of this eventuality.

The fuel ration to the business sector was cut back by a further 20% in July 1975, following a 10% cutback in March, reflecting foreign exchange strain. The 10% surcharge on income tax introduced in 1974 remained, and in April 1975, company tax was fixed at 44% instead of 40%. Higher mineworker wages were being negotiated by the Mineworkers of Rhodesia (AMR) and the Rhodesian Chamber of Mines to alleviate further possible loss of mine labor to the Republic of South Africa. A new 5-year agreement was signed by Southern Rhodesia in early 1975 with Wenela (the official recruiting organization of the Republic of South Africa), giving a minimum of $2.56 per shift for mine workers in South Africa, which was significantly higher than the 68 cents per shift claimed by the AMR for mine workers in Southern Rhodesia. Wenela was not allowed to hire men who had worked in Rhodesian mines for a year previous to their application, nor could recruitment take place in mining areas of the Midlands or in Manica, where it might compete with agricultural manpower requirements.

Electrical energy used by mining and quarrying in 1975 was 1,086 million kilowatt-hours.

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[1] Physical scientist, International Data and Analysis.

[2] When necessary, values have been converted from Southern Rhodesian dollars (R$) to U.S. dollars at the rate of R$1=US$1.60.

[3] Central Statistical Office (Salisbury). Monthly Digest of Statistics. June 1976, p. 41.

PRODUCTION AND TRADE

Mineral production was valued at $271.7 million in 1975, compared with $264.3 million in 1974. Both the mineral unit value index and the volume index (1964=100) increased in 1975 compared with 1974 indices.[4] A fall in world mineral prices and demand resulted in a reduction in value of mineral production for the last half of 1974 and first 6 months of 1975, and was reflected by the low mineral unit value index recorded for those two periods. By the last half of 1975, however, this indicator had increased by 11%. A 2% fall in terms of trade was indicated for 1975 over 1974. (The terms of trade is defined as the unit value of exports divided by the unit value of imports. The fall in terms of trade indicated a fall in export prices relative to import prices.) Unit value indices for both imports and exports increased in 1975 relative to 1974.

Exports remained firm through 1975 even though weaker prices were obtained for some items such as copper. Rhodesian exporters were somewhat wary of using Mozambique ports despite the fact that Mozambique had not yet taken action to implement sanctions and did not until early 1976. Transport problems during 1975 included congestion and workers' strikes at the port of Maputo and numerous disruptions along the rail line from Umtali. The net effect was to almost stop Rhodesian imports and exports through Mozambique during mid-1975. A report on Rhodesian trade published by the United Nations Security Council in May 1975 estimated total Rhodesian exports valued at $1,240 million in 1973.

Since the Unilateral Declaration of Independence (UDI) in 1965, few details have been available on the asbestos industry. Estimates range up to 270,000 tons produced in 1975. Rhodesia had exported 165,000 tons of asbestos in 1973, compared with 80,000 tons in 1972. Most of this was exported to Japan, West Germany, Spain, and Yugoslavia.[5] In 1975 Rhodesian asbestos exports were estimated to be 200,000 tons.

Shipments of both ferrochrome and chrome ore were delayed in 1975, sometimes as much as 30% behind schedule, owing to continuing technical problems with the railroads and the Mozambique ports. U.S. imports of Rhodesian chrome in 1975 were as follows: Chromite (all types), 138,000 tons, valued at $7.2 million; high-carbon ferrochromium, 75,855 tons, valued at $33.2 million; and low-carbon ferrochromium, 5,238 tons, valued at $5.4 million.

Copper production in general increased, but profits fell as world copper prices weakened during 1975. Gold profits increased, despite a lower output and increased working costs, as a result of higher gold prices. Production from the Coronation Syndicate Ltd. mines for the financial year ending in September 1975 (Arcturus, Mazoe, Muriel, and Inyati) was 77,800 troy ounces of gold, 169,700 troy ounces of silver, and 6,900 tons of copper from 696,000 tons of ore processed. A sharp decline in demand for nickel during the first half of 1975 led to a fall in company profits. The Anglo American Trojan and Madziwa mines produced approximately 8,816 tons of nickel (contained metal content) in 1975. Nickel production was expected to reach 2,500 tons for the financial year ending June 30, 1976, at the Shangani nickel mine, which started production in October 1975. The United States imported 2,510 tons (nickel content) from Southern Rhodesia out of the total 147,211 tons of nickel it imported for 1975. The imported nickel was valued at about $2.20 per pound, or $12.2 million for all the imported Rhodesian nickel. The export and domestic price of Rhodesian steel was increased 25% during December 1975.

Coal sales fell 11% to 2,493,108 tons for the financial year ended August 31, 1975. In the same period coke sales rose 9% to 290,076 tons. Despite unpredictable demands for coal, as well as an increased rate of taxation, the company's after-tax profit in 1975 was the highest recorded since 1971. This was due to an increased coal price from March 1, 1975, and to increased export sales of coke and coking coal in the second half of the financial year. Washed coal rose from $8.88 to $12.24 per ton, and coking coal from $10.53 to $14.40 per ton. Wankie coal sales for October, November, and December 1975 were 264,834, 257,612, and 232,178 tons, respectively. Coke sales in November and December were 15,291 and 15,678 tons, respectively.

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[4] Page 4 of work cited in footnote 3.

[5] Quarterly Economic Review (London). Rhodesia, Malawi. No. 3, Aug. 8, 1975, p. 9.

Table 1.—Southern Rhodesia: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Antimony, mine output, metal content e	200	300	300
Beryllium, beryl concentrate, gross weight e	60	60	60
Chromium, chromite, gross weight e ____thousand tons__	550	590	590
Columbium-tantalum, minerals, tantalite, gross weight e	40	40	40
Copper: [2]			
Mine output, metal content	41,821	39,295	39,491
Metal:			
Smelter e	r 37,000	41,000	43,000
Refined e	30,000	30,000	30,000
Gold, mine output, metal content e ____troy ounces__	r 800,000	800,000	800,000
Iron and steel:			
Iron ore, gross weight e ____thousand tons__	r 550	r 600	600
Pig iron and ferroalloys e ____do____	290	300	310
Crude steel e ____do____	r 300	340	350
Nickel:			
Mine output, metal content	11,800	11,500	14,000
Smelter e [3]	10,000	10,000	10,000
Silver, mine output, metal content [4] ____thousand troy ounces__	169	156	e 169
Tin:			
Mine output, metal content e	600	600	600
Smelter e	600	600	600
Tungsten, mine output, metal content [5]	154	91	38
NONMETALS			
Asbestos e	r 165,000	165,000	165,000
Cement, hydraulic ____thousand tons__	673	754	672
Fertilizer materials, crude phosphate rock e	150,000	130,000	130,000
Fluorspar e	150	180	180
Lithium minerals, gross weight e [6]	r 13,600	r 13,600	18,000
Magnesite e	20,000	20,000	20,000
Pyrite, gross weight e ____thousand tons__	73	75	75
Stone, industrial limestone e ____do____	700	750	NA
Sulfur, content of pyrite e ____do____	30	30	30
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous [7] ____do____	3,060	2,794	2,581
Coke, metallurgical [7] ____do____	237	267	e 270

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

[1] 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. Also, natural corundum, graphite and mica have been produced in the past and output presumably has continued, but no basis for estimates of output levels is available. Through 1965, annual corundum output was at a level of several thousand tons, ranking Southern Rhodesia second only to the U.S.S.R.

[2] Data are for years ending September 30 of that stated.

[3] Includes nickel content of nickel oxide and nickel fonte.

[4] Output of Inyati mine only for years ending September 30 of that stated.

[5] Output of Beardmore mine only for years ending September 30 of that stated.

[6] Data are for years ending September 30 of that stated and denote only an approximate order of magnitude.

[7] Data represent sales for years ending August 31 of that stated.

COMMODITY REVIEW

METALS

Cesium, Rubidium and Lithium.—The Bikita pegmatite, containing cesium, rubidium, and lithium minerals, was described as the largest of a group occurring in the Bikita tinfield, located 65 kilometers northeast of Fort Victoria. It formed a dike striking northeast with a length of over 1,600 meters and width up to 120 meters. The pegmatite was zoned, permitting selective mining. The minerals recovered were, in order of abundance, petalite, lepidolite, spodumene, pollucite, beryl, eucryptite, and amblygonite. Lithium minerals also occurred in pegmatites of the Enterprise area to the east of Salisbury, the Umtali District, the Mtoko District, the Insiza District, the Matolo District, the Mazoe District, and the Fort Rixon area. Deposits were also reported at Shamva, Inyanga, and near Gadzema. At Bikita a conveyor belt sorting system had been used to facilitate sorting. An experimental flotation pilot plant was also devised for flotation of lithium minerals.[6]

Chromite.—Principal chromite producers in Southern Rhodesia included the Rhodesian Vanadium Corp., Consolidated Minerals Ltd., Rio Tinto (Rhodesia), and the Union Carbide subsidiaries—Rhodesia Chrome Mines Ltd., which operated several mines in the Selukwe area and the Prince Mine in Victoria District; African Chrome Mines Ltd., at Mtoroshanga; and Union Carbide Rhomet, which operated a chrome alloy smelter at Que Que and the Lulapanzi Mine in the Gwelo District. Subsidiaries of the U.S.-owned companies came under Rhodesian Government control when sanctions were instituted in 1967. Rhodesian Vanadium Corp. became a member of the Anglo American group in 1973 when the chrome interests of Foote Mineral Co. (United States) were acquired. The mining operations of Rhodesian Vanadium Corp. became part of Rhodesian Alloys Ltd. in November 1975, according to an Anglo American statement. Rhodesian Alloys operated a ferrochrome plant in Gwelo using chrome ore from the Rhodesian Vanadium mines at Mtoroshanga (now Rhodesian Alloys Mining Division (RAMD)). Rio Tinto (Rhodesia) acquired the Frances Chrome Mine, the Rhodesian Mining Enterprises Ltd. properties of the Lomagundi District, and the Great Dyke Chrome Mines Ltd. claims of the Darwendale area in 1972.

Three types of chromite deposits, associated with ultramafics or serpentine and talc schists, are mined in Southern Rhodesia: (1) Lenticular bodies, which range from only a few tons to major ore bodies (Selukwe, Belingwe, Mashaba, and Gwanda); (2) regular chromite seams in layered complexes (the Great Dyke); and (3) eluvial deposits (certain areas of the Great Dyke). The Great Dyke was classified into four complexes from north to south, the Musengesi, Hartley, Selukwe, and Wedza. The most important was considered to be the Hartley complex. Since 1960, the chromite seams of the Great Dyke have been numbered 1 to 11 from the top down after the Worst system, introducing uniformity between mines and making seam recognition simpler. Disseminated ores are also found but are not mined. The disseminated ores can be concentrated to over 40% Cr_2O_3 with a Cr:Fe ratio of more than 2:1, and then pelletized on site. The initial cost of a concentrating plant would be a retarding factor in their development.[7]

RAMD successfully introduced new mining methods at Mtoroshanga in 1975 which were helping to cut costs and to increase production. One method uses a hydraulicking unit, which was developed in cooperation with Aquapower, a South African mining equipment company. RAMD comprises the Caesar, Vanad, and Sutton mines. Reserves were estimated at 1.3 million tons to a depth of 300 meters at the Caesar. Two new potential mining sections developed in 1974–75 were expected to produce 20,000 tons, building up to 40,000 tons, of ore per year. The capital expenditure by RAMD on prospecting was approximately $1.6 million in 1975, while a further $800,000 was spent on rehabilitation. Rio Tinto (Rhodesia) commissioned its new ferrochrome smelter at Gatooma. The smelter was a first step toward a large smelting complex designed to achieve maximum beneficiation of the group's chromite reserves. Plant capacity was not disclosed.

A bill (HR 1287) to end imports of Rhodesian chrome to the United States, as allowed under the Byrd amendment, was subject of congressional debate until September 1975, when the House of Representatives voted 209 to 187 against the bill.

Copper.—Coronation Syndicate Ltd. (a subsidiary of Lonrho Investment Co. Ltd.) reported that earnings for the financial year ending September 30, 1975, were 20% lower than in 1974. This was mostly caused by the substantial decrease in the copper price and the increase in operating costs at the company's Inyati mine. Throughput at Inyati increased from 393,000 tons of copper ore in 1974 to 402,000 tons in 1975, and the output rose from 6,116 tons of contained copper in 1974 to 6,640 tons in 1975. Long-term development at the mine would be affected by the flat-lying, 160-meter-thick dolerite intrusive that was encountered in the Eta No. 2 shaft. The nature of the ore body below the intrusive was to be established. Lonrho Investment also held 50% ownership in the Nyaschere Copper (Pvt.) Ltd. mine.

Messina (Transvaal) Development Co.

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[6] Chamber of Mines Journal (Southern Rhodesia). Background to Mining In Rhodesia, Lithium. April 1975, pp. 41–42.

[7] Airey, N. M. A Review of Chromite Mining in the Great Dyke. Chamber of Mines Journal, v. 17, No. 6, June 1975, p. 36.

Ltd. operated the MTD (Mangula) Ltd., Silverside, and Norah mines. Profits for MTD (Mangula) fell from $16.5 million in 1974 to $6.9 million for the financial year ended September 30, 1975, a reduction of 58%. Silverside production from the open pit was adversely affected by a drop in ore grade until March 1975 when underground sulfide ore production was started. This resulted in improvement in both grade and concentrator recovery. Contained copper production at Silverside was 1,674 tons. Norah mine proved and probable ore reserves were increased from 3.5 million tons at 1.37% to 5,246,000 tons at 1.26% copper. The concentrator capacity at Norah was to be doubled, costing $1.3 million and expected to be completed by early 1977. The additional copper production gained thereby was to compensate for closure of the leach plant. The Mangula mine planned to increase production at the Miriam shaft by 14% not later than the middle of 1977 to compensate for an anticipated decline in ore grade. Contained copper output to the end of September 1975 at the Norah mine was 2,757 tons and at the Mangula, 13,540 tons. Messina's Gwai River mine suspended operations on April 1, 1975, and the mine was put on a care and maintenance basis. The mine had produced 486 tons of contained copper in 1975. At Messina's Alaska mine, the tonnage milled decreased from 312,000 tons to 251,000 tons of copper ore, with a contained copper recovery of 1,753 tons. The Shackleton mine recorded satisfactory results with a production of 10,381 tons of contained copper.

Gold.—Development advances were well maintained at the three Coronation Syndicate Ltd., gold mines and total gold ore reserves for the group increased from 946,000 tons at 0.04 troy ounce per ton to 969,000 tons at 0.37 troy ounce per ton as of June 30, 1975. As a result of a major plant breakdown in January 1975, Arcturus mine throughput decreased from 95,000 to 91,000 tons for the year and production fell from 22,891 troy ounces to 22,377 troy ounces of gold. Profits increased despite lower output and increased working costs owing to higher gold prices. The tonnage milled at Mazoe increased following plant improvements made early in the year. In addition 14,000 tons of old tailings was treated. In the Mazoe District, the Bernheim prospect shaft was sunk 92 meters in difficult ground. Plant improvements completed at Muriel in the 1974 financial year operated at better than designed capacity. Production increased from 22,120 troy ounces of gold and 394 tons of copper in 1974 to 22,666 troy ounces of gold and 432 tons of copper in 1975. During 1975, Coronation acquired the entire issued capital of Tatcoll Mining Co. (Pvt.) Ltd., which had claims covering the dormant Ayshire mine. Option agreements over the Uno and Viceroy gold properties were also negotiated during the year. Located about 12 kilometers from the Arcturus mine, the ore was amenable to treatment at the Arcturus plant. At yearend, a 6-year tribute agreement was concluded for working the Mashona Kop mine, a small high-grade gold mine also located near Arcturus. The agreement included an option to purchase the property outright.

Rio Tinto (Rhodesia) purchased the Renco gold mine in 1975, located near Fort Victoria. Underground exploration and development had indicated sufficient ore reserves to justify low-tonnage operation for about 10 years. A number of gold-copper occurrences similar to Renco mineralization were found in the vicinity. Mining operations were to continue at a low level while an intensive exploration program at Renco and the surrounding areas was conducted. Sabi Consolidated Mines was developing a new underground gold mine at Shabani. The Globe and Phoenix Co. underground mine at Que Que was shut down in early 1975. Underground machinery and equipment were being sold, but some gold was expected to be extracted from the tailings dumps even though mining operations had ended. Banket Mine Private Ltd. (a subsidiary of Falconbridge Nickel Mines Ltd.) completed dewatering of the old workings in the Feudal mine, and shaft sinking was started at the bottom of the old shaft. Exploration in old workings in the upper part of the mine added 130,000 tons of ore to reserves. In 1974, Banket Mines milled 161,000 tons of ore, with 22,201 troy ounces of gold produced. The Athens and Falcon claims were acquired by Homestake Mines (Pvt.) Ltd. Reserves at the Athens had been indicated as approximately 270,000 tons containing 0.26 troy ounce per ton of gold, 0.42 troy ounce per ton of silver, and 1.51% copper. Reclamation of the Falcon mine, located west of the Athens, was to be considered once the Athens was established as a full-scale mining operation. The Falcon mine had been previously worked to 17 levels and was subsequently flooded to within 30 meters of the surface. The Chamber of Mines announced that more than 70 new gold mines had come into operation in 1975, encourage' by the high price of gold and by the Government's new policy of easier loans for prospectors.[8]

Iron and Steel.—In early 1975, the United Nations Sanctions Committee asked all nations to ban Rhodesian steel imports after learning of a multinational scheme to finance a 600,000-ton-per-year increase in the steelmaking capacity of Rhodesian Iron and Steel Corp. Ltd. (RISCO) to a 1-million-ton-per-year total capacity. Financing was to be arranged via a South African company and several European and Swiss banks and steel firms. The European Economic Community's (EEC) Technical Research Committee also approved a grant of about $44,000 toward a project that was sponsored by the International Pig Iron Secretariat, of which Southern Rhodesia is a full member. The project concerned development of a new pig-iron-casting process and was to be undertaken jointly by RISCO, the British Pig Iron Group and their counterparts in France, Italy, Finland, Norway, and Sweden.

Rhodesia exported some 214,000 tons of pig iron and 80,000 tons of steel in 1975, before sanctions were imposed. Another 60,000 tons of steel was consumed locally. Estimated iron ore resources at that time included more than 200 million tons of relatively high-grade material with an iron content ranging from 55% to 65%. RISCO was owned by a consortium composed of Anglo American Corp., British South Africa Co., Lancashire Steel Co., Messina (Transvaal) Development Co., Rhodesian Selection Trust Co., Stewarts and Lloyds, and Tanganyika Concessions.[9] Iron ore mining companies in 1975 included RISCO, Africa Strip Mining Co. (Buchwa mine), Belingwe Mining Investments (Pvt.) Ltd., Ingezi Mining Co., (Pvt.) Ltd., and Iron and Mineral Development Co. The Mashonaland Iron and Steel Co., a subsidiary of the More Wear Group, embarked on a $5.1 million expansion program in 1975. The new plant was scheduled to have two ore furnaces that were to provide 500 tons of steel castings per month and 1,000 tons of iron castings. Most production was intended for export. RISCO was also upgrading the Redcliff steelworks and stage II of the development was expected to be complete by 1976.

Nickel.—Johannesburg Consolidated Investment Company Ltd.'s (JCI) (55.2% owned) Shangani Mining Corp., Ltd.'s nickel mine, 12 kilometers northeast of Insiza, started production in October 1975. The initial prospecting program was carried out by Prospects of Rhodesia (Pvt.) Ltd. (POR), wholly-owned subsidiary of JCI. Shangani Mining took over exploration operations in January 1972, and by December 1974 underground development was being done. Nearly 2 million cubic meters of overburden were removed to start open pit operations on two ore bodies, comprising east and west mineralized lobes of serpentinite intruded into older bedded tuffs and metabasalts. Both ore bodies have a continuous strike of 140 meters, but the eastern ore body was presumed to be the larger. Approximately 3.9 million tons, grading 0.81% nickel, were assumed to be amenable to open pit mining; the balance of 15.2 million tons grading 0.77% nickel was expected to be mined by underground operations. Production of 2,500 tons of nickel and 400 tons of copper was forecast for the financial year ending June 30, 1976. The final cost of JCI's Shangani mine development was $34.1 million.

The Rhodesian Nickel Corp.'s Epoch mine was on schedule to start production in January 1976. The cost of bringing the Epoch mine onstream was estimated at $10.1 million. Located near Filabusi, the Epoch mine had a potential of 2.5 million tons per year with an average grade of 0.75% nickel. At Rhodesian Nickel's Trojan mine, a new subvertical shaft was underway for exploitation of the lower levels. The Trojan ore graded 0.65% nickel, and an estimated 900,000 tons of ore was milled during 1975. Rhodesian Nickel's Madziwa mine milled just over 1 million tons, grading 0.94% nickel and 0.31% copper. The electric smelting furnace at Rhodesian Nickel's Bindura Smelting and Refining Co. (BSR) was commissioned in November 1975. A major setback took place a week after the furnace was commissioned when a slag runaway

[8] Chamber of Mines Journal. Gold Hits the Headlines. V. 17, No. 90, October 1975, p. 34.
[9] Journal of Metals (Salisbury). Iron and Steelmaking in Rhodesia. V. 17, No. 4, April 1965, p. 380.

penetrated the main power station, causing a fire. BSR had a 10-year agreement to smelt and refine copper-nickel from Shangani. The $13.9 million expansion to the Bindura plant was launched to treat both Shangani concentrates and the expected production of the Epoch mine. Rhodesian Nickel's profits fell 9% in 1975 to $3.7 million. Profits were good during the last half of 1974, but a sharp decline in demand during the first half of 1975 led to comparatively poor results. Rhodesian Nickel Corp. was owned by Anglo American Corp.

Rio Tinto's Perseverance mine shutdown in 1975 because of metallurgical problems caused by arsenic in the ore. The smelter feed ratio of Perseverance to Empress ore was adjusted to compensate for the high arsenic content. Stockpile ore was expected to last the smelter through 1976 when problems were expected to be solved. Mining was to resume in 1977.

Tin.—The most important tin occurrences in Southern Rhodesia were in the Kamativi tin belt 50 kilometers east of Wankie. All deposits were the pegmatite type, as in the areas of Myagomo, located 20 kilometers east of Kario, and in Bikita, located 60 kilometers east of Fort Victoria. The only underground mine was at Kamativi. Small alluvial deposits were also worked in Rhodesia by panning or simple sluice box. Kamativi Tin Mines, a subsidiary of N.V. Billiton Maatschappy of the Netherlands, had its own treatment, crushing, and milling plant. The company also owned a smelter (Kamativi Smelting and Refining) in which tin and various alloys for solders were produced. Kamativi declared a record profit of $3.5 million for 1974 and was to spend $6 million on deepening the shaft to facilitate underground exploration. Work began in November 1974 and was expected to be completed by September 1975.

Uranium.—During 1975, Gold Fields Prospecting Co. of South Africa was active in uranium prospecting in Southern Rhodesia.

NONMETALS

Asbestos.—The Rhodesian and General Asbestos Corp. (Pvt.) Ltd. (a subsidiary of Turner and Newall Ltd. of the United Kingdom) dominated the industry with its Shabanie mine in the Shabani District and its King and Temeraire mines in the Mashaba District in south-central Southern Rhodesia. Pangani Asbestos Mine (Pvt.) Ltd. controlled the Pangani, Boss, Vanguard, and Rex mines in the Bulawayo—Shabani region. The Kudu Mines (Pvt.) Ltd. asbestos mine located near Essexvale was to boost the milling rate from 200 to 1,000 tons per day, and a new tower dryer was to be constructed. In the past, work had to be halted during the rainy season because the asbestos could not be dried. The milling rate was planned to be more than 360,000 tons of ore containing 6% to 7% short-fiber asbestos within a year. Ore reserves in the main Kudu Mines quarry were estimated at 5 million tons with approximately another 15 million tons beneath the quarry floor. Two additional quarries were under development. The asbestos was to be used mainly in the asbestos cement industry and for water, wine, and scent filters. A new mill was to be constructed to achieve the increased production by mid-1977. Asbestos was to be also extracted from the dump, which runs about 4% asbestos, by a high-speed milling and degritter machine. Other asbestos mining companies included D.S.O. Asbestos (Pvt.) Ltd., Thornwood Asbestos Mines (Pvt.) Ltd. (two mines in the Gwanda District), and Bend Asbestos Ltd.

Diamond.—Intensified prospecting was being carried out by Kimberlitic Searches and Prospecting Ventures Ltd., a subsidiary of DeBeers Consolidated Mines of South Africa, near the border of the Republic of South Africa at Beit Bridge. Kimberlitic Searches had pegged a small area where preliminary work indicated more intensive prospecting. Diamonds mined earlier in the century at Somabula near Gwele were alluvial. It was Kimberlitic Searches, which has been systematically searching for diamonds in Rhodesia from its Bulawayo base for about 10 years, that found the Orapa diamond pipes in Botswana.

Emerald.—A new emerald mine, claimed to be the largest in Southern Rhodesia, started partial production. The mine, situated 75 kilometers northwest of the Rio Tinto Sandawana mine, was owned by a Filabusi miner.[10]

Phosphate.—Phosphate output was from the African Explosive and Chemical Industries Ltd. (AE & CI) mine at Dorowa. The

[10] Barclay's National Review (London). Rhodesia Mining. March 1976, p. 10.

apatite ore, occurring in igneous rocks of a carbonatite complex, contained between 4% and 13% P_2O_5 over a 10-square-kilometer area. The concentrate was shipped to a plant at Msasa on the eastern outskirts of Salisbury. Three other carbonatite complexes were also the subject of investigation: The Katete occurrence in northwest Rhodesia on the Gwai River, the Shawa complex in the Sabi Valley, and the Chishanya complex located 25 kilometers north of Birchenough Bridge and 90 kilometers southeast of Shawa and Dorowa. The Shawa deposits, reportedly superior to the Dorowa deposits were to be developed in the near future.[11] The Katete carbonatite complex did not contain appreciable phosphate minerals. Three mining companies had claims in the Chishanya area. Apatite is largely restricted to narrow intrusive carbonate bands, each up to 3 meters wide, making separation of the apatite from the carbonate host rocks difficult. Carbonate is undesirable in the manufacture of superphosphates. The P_2O_5 content of the Chishanya rocks ranges from less than 3% to over 20% in the iron-rich, calcium-magnesium carbonate rock. An occasional specimen contains about 25% P_2O_5. Consideration was being given to using the finely ground apatite-rich carbonatite directly for pasture improvement and agricultural purposes. A salable product from Chishanya would contain approximately 10% P_2O_5 in mixed calcium, magnesium, and iron carbonate.

MINERAL FUELS

Coal.—An oil-from-coal plant was an important topic for discussion at the energy symposium held in Bulawayo in 1975. Rio Tinto (Rhodesia) Ltd. announced that it could build the plant for Rhodesia and that finance would be no problem. Over 10 years, the plant could be developed at a cost of $384 million, complete with mine, town, and rail and road services. Gold Fields Ltd. was to do a feasibility study on the Bubi coalfield as the latest stage in its recent prospecting program east of Beitbridge. Gold Fields Prospecting Co. (Pty.) Ltd. explored the same area in 1962. Analyses from drill holes showed that the coal had excellent coking quality; calorific value was more than 13,000 Btu per pound and ash content was 10% to 12%. The Bubi Field was believed to contain at least 15 million tons of economic coking coal. Early in 1975, the Government also granted a 3-year prospecting license to Gold Fields for oil, coal, copper, nickel, and zinc over an area covering more than 480 square kilometers in the Bulawayo and Victoria mining districts.

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[11] Chamber of Mines Journal (Salisbury). "Phosphates for the Future". V. 17, No. 12. December 1975, pp. 37–38.

The Mineral Industry of the Territory of South-West Africa

By Candice Stevens [1]

The mineral industry of the Territory of South-West Africa continued to be the dominant factor in the country's economy in 1975. Although statistics were not available, the value of mineral exports was estimated at $320 million,[2] accounting for about 60% of the value of all exports. The production of diamonds, which increased significantly during the year, remained the Territory's foremost mineral activity. Other key minerals, particularly the production of base metals by Tsumeb Corp. Ltd. and of metallic concentrates by the South-West Africa Co. Ltd. (SWACO), showed a general decline. The overall effects on the natural resources of the Territory of South-West Africa, of a United Nations decree prohibiting the export of mineral commodities from the Territory without the prior authorization of the U.N. Council for Namibia had yet to be determined.

Although exploration activity was at a low level in 1975, development of facilities and ongoing projects continued on schedule. Both the Asis Ost copper mine of Tsumeb Corp. and the Otjihase copper mine, a joint venture of Minerts Development (Pty.) Ltd. and Johannesburg Consolidated Investment Co. Ltd. (JCI), came onstream in 1975. SWACO brought its Brandberg West tin-tungsten mine back into production after a 2-year dormant period and initiated production on a trial basis at the Otjivalunda saltpans. Development of the Rössing uranium project, expected to become the world's largest producer when output commences in 1977, progressed during the year, and sales contracts were settled for the marketing of output. However, in the petroleum sector, extensive prospecting for offshore oil and gas failed to locate any commercially viable sources, prompting a number of companies to relinquish their exploration rights during the year.

The most promising new source of power for the Terrority's large mineral industry was the Ruacana Falls hydroelectric scheme on the Cunene River bordering Angola. Construction began in early 1973 under the direction of the South-West Africa Water and Electricity Corp., the agency established by the Industrial Development Corp. (IDC) of the Republic of South Africa for supervision of electric power production. Major construction work was being performed by an Italian consortium, Construzioni Internazionali, at a cost of $307 million. The project comprised a diversion dam immediately above the falls, which channeled the Cunene waters through an open headbay into feeder tunnels which then led to turbines in an underground powerhouse. The regulating dams for the project were at Gove and Calueque in Angola, which were also to divert water for major irrigation projects in Angola and Ovamboland in the northern Territory of South-West Africa.

Upon completion in 1977, initial capacity was to be 160 megawatts, increasing to 320 megawatts by 1982. The annual output of about 1.2 billion kilowatt hours was to be transmitted into the South-West African

[1] Economist, International Data and Analysis.
[2] Where necessary, values have been converted from South African Rand (R) to U.S. dollars at a rate of R1=US$1.3663 (average of monthly averages for 1975 as given in International Financial Statistics).

grid reaching to the main centers of Windhoek, Tsumeb, and Walvis Bay. The expected fivefold increase in the production of electric power was to support new copper mines and the uranium mine, and to provide energy for further industrial development in the Territory of South-West Africa.

PRODUCTION AND TRADE

The South-West Africa Administration, Republic of South Africa, continued its policy of not disclosing mineral production statistics for the Territory of South-West Africa. Most of the statistical data on production were derived from the annual reports of companies operating in the Territory, primarily Tsumeb Corp., Consolidated Diamond Mines of South-West Africa Ltd. (CDM), and SWACO. Although the Territory of South-West Africa traditionally produces a variety of other minerals, particularly nonmetals, output data are not available and these commodities are not listed in table 1.

In general, mining activity in the Territory of South-West Africa in 1975 was adversely affected by falling mineral prices, a deteriorating economic situation, and increased operating costs. Production of cadmium, silver, blister copper, and refined lead by Tsumeb Corp. all declined during fiscal 1975. Output of lead-zinc concentrates at SWACO's Berg Aukas mine was at a reduced level, and overall tin-tungsten production in the Territory fell slightly. Only diamond recovery by CDM evidenced a gain over the 1974 level, due to the installation of modernized equipment and the improvement in diamond grade.

The Territory of South-West Africa's foreign trade in mineral commodities was included in the trade statistics of the Republic of South Africa and was not differentiated. Apart from some tin and zinc, consumed by the Republic of South Africa, and diamonds, marketed by DeBeers Consolidated Mines Ltd., most of the mineral production was shipped to world markets from Walvis Bay, the area's major deepwater port.

Table 1.—Territory of South-West Africa: Production of mineral commodities
(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS [2]			
Arsenic, white [3]	8,147	6,640	6,663
Cadmium:			
Mine output, metal content, recoverable	131	126	118
Metal, refined	104	114	100
Copper:			
Mine output, metal content, recoverable	34,168	[4] 32,478	[4] 39,034
Metal, blister	36,049	46,612	36,410
Lead:			
Mine output, metal content, recoverable	61,694	56,761	48,800
Metal, refined	63,592	64,342	44,300
Silver:			
Mine output, metal content, recoverable [5] thousand troy ounces	[r] 1,931	1,904	1,823
Smelter output, content of blister copper do	1,998	2,395	2,077
Tin, mine output, metal content, recoverable	792	781	760
Tungsten, mine output, metal content, recoverable	22	--	7
Vanadium, mine output, metal content	649	819	562
Zinc, mine output, metal content [6]	37,919	38,461	33,118
NONMETALS			
Diamond: [7]			
Gem thousand carats	1,520	1,491	1,660
Industrial do	80	79	88
Total do	1,600	1,570	1,748
Lithium minerals [8]	[r] 5,365	37,762	51,573
Pyrite concentrate, gross weight	12,183	9,566	9,643
Salt	147,000	209,000	[e] 210,000
Sulfur, content of pyrite	5,540	4,480	4,455
Wollastonite	1,800	1,000	NA

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

[1] In addition to the commodities listed, the Territory of 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, sand, 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 Pinah 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] Figures comprise reported production of Tsumeb Corp. Ltd., and Oamites Mining Co. (Pty.) Ltd., plus an estimate for Klein Aub Koper Maatskappy Ltd. for 1974 and 1975, and an estimate for Johannesburg Consolidated Investment Co. Ltd. (Otjihase copper mine) for 1975.

[5] Figures comprise reported production of Tsumeb Corp. Ltd. plus estimates for Oamites Mining Co. (Pty.) Ltd., and Klein Aub Koper Maatskappy Ltd.

[6] Compiled from operating company reports of Tsumeb Corp. Ltd., South-West Africa Co. Ltd., and ISCOR for Imcor Zinc (Pty.) Ltd.'s Rosh Pinah mine. Data from Tsumeb Corp. Ltd. are for calendar years, data from other companies are for fiscal years ending June 30 of the year stated.

[7] Total figures reported by DeBeers Consolidated Mine Ltd. in company annual reports for calendar years; detail on gem and industrial diamonds are estimates, assuming output to be 95% gem quality.

[8] Output has not been officially reported since 1966, but presumably has continued since a number of countries record imports from "South Africa", which in total quantity considerably exceed reported output of the Republic of South Africa proper, and presumably include shipments from the Territory of South-West Africa. Quantities given represent imports of the United States and the European Community reported as originating in South Africa, but the reader is cautioned that a portion of the material may have been mined in Southern Rhodesia.

COMMODITY REVIEW

METALS

Total metal sales of Tsumeb Corp. Ltd., the principal producer of copper, lead, zinc, silver, cadmium, and arsenic, decreased 24% (in terms of rand) from those of the previous fiscal year. In 1975, Tsumeb Corp.'s revenue from metal sales was approximately $75 million, including $20.5 million from custom material processed in the company's lead and copper smelters. The principal shareholders in Tsumeb Corp. were American Metal Climax Inc. (29.6%), Newmont Mining Corp. (29.6%), and O'okiep Copper Co. of South Africa (9.5%).

Tsumeb's three older mines have traditionally accounted for about 80% of the base metal production in the Territory of South-West Africa. In 1975, the Tsumeb mine, the largest of the three, milled approximately 424,000 tons of ore grading 4.27% copper, 9.73% lead, and 2.47% zinc. The Kombat mine, situated just south of the Tsumeb mine in the northern part of the country, milled about 284,000 tons of ore assaying 1.32% copper and 2.32% lead.

Table 2.—Territory of South-West Africa: Operations of Tsumeb Corp. Ltd.

		1974	1975
Tsumeb mine and mill:			
Ore mined, gross weight	metric tons	421,204	423,618
Ore milled, gross weight	do	421,204	423,618
Metal content:			
Copper	percent	4.36	4.27
Lead	do	10.06	9.73
Zinc	do	2.30	2.47
Silver	ounces per metric ton	3.15	2.86
Concentrate production:			
Lead concentrate:			
Gross weight	metric tons	99,472	102,574
Metal content:			
Copper	percent	7.70	7.79
Lead	do	37.23	35.00
Zinc	do	4.83	5.07
Silver	ounces per metric ton	5.69	4.98
Copper concentrate:			
Gross weight	metric tons	22,929	22,161
Metal content:			
Copper	percent	42.00	39.76
Lead	do	11.54	11.07
Silver	ounces per metric ton	29.51	28.03
Zinc concentrate:			
Gross weight	metric tons	2,908	3,384
Metal content:			
Zinc	percent	52.76	51.31
Cadmium	do	.98	.94
Mill recovery (from all concentrates):			
Copper	percent of metal in ore milled	94.19	92.77
Lead	do	93.60	93.03
Zinc[1]	do	15.86	16.61
Kombat mine and mill:			
Ore mined and milled:			
Gross weight	metric tons	353,070	284,242
Metal content:			
Copper	percent	1.19	1.32
Lead	do	2.62	2.32
Silver	ounces per metric ton	.42	.42
Concentrate production:			
Copper concentrate:			
Gross weight	metric tons	12,824	11,280
Metal content:			
Copper	percent	21.68	21.62
Lead	do	7.22	7.30
Silver	ounces per metric ton	5.69	5.82
Lead concentrate:			
Gross weight	metric tons	14,854	10,874
Metal content:			
Copper	percent	7.90	9.82
Lead	do	51.92	47.13
Silver	ounces per metric ton	2.50	2.86
Mill recovery (from all concentrates):			
Copper	percent of metal in ore milled	93.99	93.70
Lead	do	93.27	90.37

See footnotes at end of table.

Table 2.—Territory of South-West Africa: Operations of Tsumeb Corp. Ltd. —Continued

	1974	1975
Matchless mine and mill:		
Ore mined and milled:		
Gross weight ---metric tons--	108,344	102,133
Metal content:		
Copper ---percent--	1.93	2.72
Sulfur ---do----	15.63	16.06
Concentrate production:		
Copper concentrate:		
Gross weight ---metric tons--	8,248	12,250
Metal content:		
Copper ---percent--	22.68	20.64
Sulfur ---do----	17.31	26.51
Pyrite concentrate:		
Gross weight ---metric tons--	9,566	9,643
Metal content:		
Copper ---percent--	1.68	1.93
Sulfur ---do----	46.83	46.20
Mill recovery (from all concentrates):		
Copper ---percent of element in ore milled--	96.93	97.85
Sulfur ---do----	43.76	53.67
Asis Ost mine:		
Ore mined and milled:		
Gross weight ---metric tons--	5,730	21,683
Metal content:		
Copper ---percent--	.81	1.26
Lead ---do----	.38	.33
Silver ---ounces per metric ton--	.42	.68
Concentrate production:		
Copper concentrate:		
Gross weight ---metric tons--	142	567
Metal content:		
Copper ---percent--	27.77	39.64
Lead ---do----	6.40	6.54
Silver ---ounces per metric ton--	15.24	22.41
Mill recovery (from all concentrates):		
Copper ---percent of metal in ore milled--	84.99	82.56
Smelting and refining:		
Copper concentrates smelted [2] ---metric tons--	47,027	43,743
Average assay:		
Copper ---percent--	32.39	30.43
Lead ---do----	7.98	7.27
Silver ---ounces per metric ton--	17.04	15.63
Lead concentrates smelted [2] ---metric tons--	114,133	110,362
Average assay:		
Copper ---percent--	7.68	8.07
Lead ---do----	39.24	36.21
Silver ---ounces per metric ton--	5.30	4.79
Custom materials smelted:		
Copper concentrate ---metric tons--	47,362	36,060
Average assay:		
Copper ---percent--	47.09	41.85
Lead ---do----	1.73	2.13
Silver ---ounces per metric ton--	14.88	18.70
Lead concentrate ---metric tons--	32,277	9,696
Average assay:		
Copper ---percent--	3.59	1.95
Lead ---do----	59.09	56.59
Silver ---ounces per metric ton--	13.66	28.97
Metal sales:		
Value ---thousands--	$106,795	$75,055
Quantity:		
Arsenic, refined As_2O_3 ---metric tons--	6,640	6,663
Cadmium ---kilograms--	132,708	123,608
Copper, electrolytic ---metric tons--	31,424	31,015
Lead ---do----	60,852	52,670
Silver ---troy ounces--	2,215,911	1,760,665
Zinc ---metric tons--	1,836	1,543

[1] Concentrates from Tsumeb Corp. Ltd.
[2] Production.

The Matchless mine, which came onstream in 1970 about 42 kilometers south of Windhoek, milled 102,000 tons of ore grading 2.72% copper. The Matchless mine also produced pyrite concentrate, which was shipped to Tsumeb for use in lead smelting. The Asis Ost mine, a joint venture between Tsumeb Corp. (75%) and SWACO (25%), began production on a limited scale during the year, the ore being treated at the adjacent Kombat mill. In 1975, production at Asis Ost was approximately 22,000 tons of ore grading 1.26% copper and 0.33% lead.

The smelter production at Tsumeb in 1975 was 36,410 tons of blister copper and 44,300 tons of refined lead, compared with 46,612 tons of blister copper and 64,342 tons of refined lead in 1974. These constituted decreases of 22% and 31%, respectively, and reflected the lower concentrate output from Tsumeb mines and the decreased percentage of custom material. During 1975, a total of 3,384 tons of zinc concentrate was exported from Walvis Bay for overseas smelting and refining.

The expansion of the Tsumeb copper smelter for an additional 127,000 tons per year of custom material, expected to come primarily from the new Otjihase mine, was scheduled for completion in early 1976 at a cost of $14 million. Construction of a new copper refinery at Capetown, Republic of South Africa, a joint venture between Tsumeb Corp. and O'okiep Copper Co. of the Republic of South Africa, was deferred in February 1975.

Tsumeb Corp. continued exploration and development at its four mines during the year. After taking into consideration ore mined during 1975 and after a recalculation of ore reserves based on information from diamond drilling, positive ore reserves decreased from the 1974 levels. Positive ore reserves at the Tsumeb mine decreased 441,062 tons; at the Kombat mine, 225,205 tons; and at the Matchless mine, 149,745 tons. A complete reappraisal of reserves at Asis Ost was also necessitated, resulting in a decrease in positive ore reserves of 202,683 tons and an overall net loss of about 177,000 tons. Ore reserves at yearend 1975 are given in table 3.

In other exploration activity, Tsumeb Corp. placed emphasis on the reevaluation of known prospects within the Otavi Mountains concession area. Diamond drilling at Asis West, situated west of the Kombat mining district, continued with good results, and 897,319 tons of ore grading 7.18% copper and 4.82% lead was delineated by yearend 1975. Of this tonnage, about 199,000 tons was located within the Asis mining district operated by Tsumeb Corp; the remainder was within the prospecting area shared by Tsumeb Corp. and SWACO. Two of Tsumeb Corp.'s other joint prospecting arrangements were terminated in 1975. Due to discouraging results, exploration by Tsumeb Corp. in conjunction with Anglo-Transvaal Consolidated Investment Co. (Anglovaal) ended at yearend 1975, and the joint venture relinquished its rights in the Gamma Mining and Prospecting Co. Exploration results in a joint venture in Botswana managed by United States Steel Corp. were similarly discouraging despite findings of considerable copper mineralization, and Tsumeb Corp. withdrew from further participation in January 1975.

Table 3.—Territory of South-West Africa: Ore reserves of Tsumeb Corp. Ltd.[1]

	Quantity (thousand metric tons)	Grade (percent)			
		Copper	Lead	Zinc	Sulfur
Positive ore:					
Tsumeb	5,051	4.56	7.75	2.06	--
Kombat	858	1.85	3.09	--	--
Matchless	985	2.35	--	--	12.57
Asis Ost	238	2.81	.71	--	--
Probable ore:					
Tsumeb	2,478	2.40	1.76	.04	--
Kombat	929	1.92	2.34	--	--
Matchless	262	2.40	--	--	11.93
Tentative ore:					
Tsumeb	741	4.40	5.68	2.05	--
Kombat	142	1.71	2.97	--	--
Matchless	1,533	2.45	--	--	14.45
Asis Ost	58	1.21	2.97	--	--

[1] As of Dec. 31, 1975.

Arsenic.—A total of 18,724 tons of reverberatory and converter baghouse dusts, dross skims, and storage material was roasted at the arsenic plant operated by Tsumeb Corp. in 1975. A total of 6,687 tons of arsenic trioxide material of various grades was produced, compared with 6,722 tons in 1974. Approximately 6,770 tons of pyrite concentrate from the Matchless mine was used as roaster flux. Total sales by Tsumeb of arsenic trioxide were 5,138 tons, a 5% decrease from the 1974 level.

Cadmium.—During 1975, Tsumeb Corp. processed 3,071 tons of sinter baghouse dust, producing 100 tons of refined cadmium, 14 tons less than in 1974. The assay of refined cadmium produced continued at 99.98% pure. Total sales of cadmium in 1975 were 124 tons, valued at about $916,000.

Copper.—The other major copper producer in addition to Tsumeb Corp. was Oamites Mining Co. (Pty.) Ltd., a joint venture between Falconbridge Nickel Mines Ltd. (FNM) of Canada and the IDC. The Oamites mine, 55 kilometers south of Windhoek, milled 568,000 tons of ore in 1975, a decrease of 8% from the 1974 level of 617,000 tons. However, owing to improved grade and mining control and higher metallurgical recovery, copper production increased from 6,356 tons in 1974 to 6,852 tons in 1975. Development kept pace with the requirements of mining operations, and installation of a crusher and conveyer belt at the 34th level was near completion at yearend. Production statistics for the Oamites mine for 1974 and 1975 are as follows:

	1974	1975
Ore milled ....tons..	617,000	568,000
Mill head grade ....percent..	1.13	1.31
Mill recovery ......percent..	91.32	93.40
Concentrates produced dry tons..	19,000	19,000
Recoverable copper ...tons..	6,356	6,852

Although Falconbridge Exploration Ltd., a subsidiary of FNM, announced plans in 1974 to develop its copper-zinc sulfide deposit at Elbe, this action was deferred in 1975 owing to low copper prices. Mine development costs had been set at $13 million, with startup at a milling capacity of 35,000 tons per month scheduled for 1976. Drilling at FNM's Swartmodder prospect, located near Elbe at Okahandja, was also suspended.

The mine owned by Klein Aub Koper Maatskappy Ltd., a subsidiary of General Mining and Finance Corp. Ltd. (South Africa), was the third largest operating copper mine in the Territory. Total ore reserves were reported at 8 million tons of copper-silver ore grading 2.5% copper. During 1975, the profitability of the Klein Aub mine was seriously affected by the decrease in copper prices coupled with increased production and smelting costs. Although concentrate output grew from 7,840 tons in 1974 to 8,946 tons in 1975, the company's net income fell from about $1.8 million in 1974 to $735,000 in 1975. However, the program for the improvement of existing facilities was completed during the year, and the company planned an expansion of production at lower costs. A review of the mining potential of the Okasewa copper deposits near Witvlei was also conducted during the year.

The Otjihase copper mine, owned by JCI (52.5%) and Minerts Development (Pty.) Ltd. (47.5%), came onstream in October 1975. Initial production was less than capacity due to technical problems, but normal milling was to begin in the second quarter of 1976. Planned output was an annual rate of 115,000 tons of 22% copper concentrates, which would be smelted at the Tsumeb plant prior to export for refining in Europe. The capital cost of development of the Otjihase mine, situated 27 kilometers northeast of Windhoek, was approximately $48 million. Surface drilling during the year indicated reserves of 23 million tons averaging 2.4% copper.

Lead, Zinc, and Vanadium.—Concentrate production at the Berg Aukas lead-zinc-vanadium mine, operated by SWACO near Grootfontein, declined 18% in fiscal year 1975. Total concentrate output was 41,773 tons in 1975, compared with 50,708 tons in 1974. In an effort to streamline plant operation, milling capacity was reduced to 124,000 tons per year, which resulted in an 8% decrease in ore milled during 1975. In addition, the grade of ore mined and hoisted was adversely affected by a decrease in the quantity of vanadium-rich cavity fill material and by operating difficulties at lower mine levels. These factors resulted in 31% and 23% production decreases in lead-vanadium and zinc-silicate concentrates, respectively. Total combined lead and zinc sulfide production was slightly higher than in 1974. Production statistics for the Berg Aukas mine in fiscal 1975 are as follows:

	Quantity (metric tons)		Grade (percent)		
	1974	1975	V_2O_5	Lead	Zinc
Ore hoisted	172,300	209,600	0.70	4.2	13.8
Ore milled	135,000	123,700	1.10	6.3	21.7
Concentrates:					
Lead vanadates	8,348	5,771	17.37	42.6	18.2
Zinc sulfide	11,436	9,541	--	4.6	54.1
Lead sulfide	1,214	3,551	--	53.0	17.8
Zinc silicates	29,710	22,910	--	4.5	46.7

The company continued development of ore bodies on the 17 and 19 levels. The No. 2 shaft was deepened about 100 meters, and additional shaft-deepening and dewatering operations were scheduled for 1976. Drilling indicated no major new ore discoveries, but sufficient ore was located to replace most of that mined from previously indicated blocks. The ore reserves at the end of fiscal year 1975 at the Berg Aukas mine are as follows:

Locality	Quantity (thousand metric tons)	Grade (percent)		
		V_2O_5	Lead	Zinc
No. 1 shaft	102	0.6	3	21
No. 2 shaft	1,396	.4	5	16
Possible No. 2 shaft	307	.5	3	20
Total mine 1975	1,805	.5	5	17
Total fiscal 1974	1,830	.5	4	17

The other major lead-zinc producer in the Territory was the Rosh Pinah mine of Imcor Zinc (Pty.) Ltd., a subsidiary of the South African Iron and Steel Industrial Corp. (ISCOR). Although zinc concentrate production in 1975 increased 3% to 27,100 tons, lead concentrate production fell 31% to 5,288 tons. The total output of zinc concentrate, which had a zinc metal content of 52.3%, was dispatched to the Republic of South Africa for processing in an electrolytic refinery near Springs; lead concentrate production was marketed in the Territory. Production at the original underground mine at Rosh Pinah, located in the Namib Desert about 27 kilometers north of the Orange River, was discontinued at yearend 1975 owing to the depletion of reserves. Production from the new open pit mine began in 1974 and was scheduled to reach 160,000 tons of mine-head output per month by 1976. Continued exploration for zinc ore was planned by ISCOR in the existing mining area of Rosh Pinah and farther north.

Silver.—Domestic production of silver, a byproduct of copper and lead mining, declined 4%, from 1,904,000 troy ounces in 1974 to 1,823,000 troy ounces in 1975. The largest silver producer continued to be Tsumeb Corp., which recovered 1,205,843 troy ounces in company-produced concentrates compared with 1,325,407 troy ounces in 1974. The balance of silver production was from the Klein Aub copper mine near Rehoboth. Virtually all silver produced in the country was processed by Tsumeb Corp., which exported the silver contained in blister copper and in the form of dore bullion for toll refining elsewhere. In 1975, total sales of silver by Tsumeb Corp., which also custom-smelted imported concentrate, amounted to 1,760,665 troy ounces valued at $7.8 million.

Tin-Tungsten.—The Uis tin mine, operated by ISCOR's wholly-owned subsidiary of Industrial Minerals and Mining Corp. (Pty.) Ltd., continued to be the Territory's major tin producer. In 1975, production was 1,177 tons of tin concentrate with a tin metal content of 64.6%, a slight decrease from the 1974 level. Output from the Uis mine, located northeast of Swakopmund near Brandberg, was shipped to the smelting plant at Vanderbijlpark steelworks in the Republic of South Africa, where it accounted for nearly half of ISCOR's tin requirements.

SWACO brought its Brandberg West tin-tungsten mine back into production in mid-1975 on a trial basis. Operations had been suspended in 1973, but in late 1974 the company commenced overburden stripping of the mine and plant rehabilitation. Exploratory drilling indicated an additional block of some 600,000 tons of ore of better than average grade in the northeast of the quarry, which was to be mined while overburden stripping of the west face continued. Total ore reserves of the mine were estimated at 6.6 million tons grading 0.24% combined tin and tungsten and requiring the removal of approximately 3.7 million tons of overburden.

The only tungsten producer in the Territory in 1975 was Nordex Joint Venture Ltd., owned by Ebco Mining Co. (60%) and Nord Resources Corp. (40%), the latter serving as operator and marketing all output. Annual capacity at the Krantzberg tungsten mine, situated about 160 kilometers south of Windhoek near Omaruru, was approximately 500 tons. However, the plant was reported as operating at about half of capacity, with total output exported to European markets.

Uranium.—Development continued at the uranium deposit owned by Rössing Uranium Ltd., projected to become the world's single largest uranium producer when the mine comes onstream in 1977. Rössing's production target was revealed for the first time in 1975, with output set at 5,000 tons of U_3O_8 per year. The large but low-grade uranium ore body, situated 70 kilometers northeast of Swakopmund, was to be mined by open pit methods. The mining rate of ore and overburden was to start at a capacity of 60,000 tons per day, building up to 120,000 tons per day by 1980. Estimated reserves of uranium oxide exceeded 100,000 tons.

Sales contracts for the major part of production were reportedly finalized during the year. The United Kingdom Atomic Energy Commission contracted to receive 7,500 tons of uranium between 1977 and 1982 at a price just under $13 per pound. The balance of production was to be marketed in Europe and Japan. Shareholders in the Rössing venture included Rio Tinto Zinc Corp. Ltd. (45.2%), IDC, General Mining and Finance Corp. Ltd. of South Africa, Total Compagnie Minière et Nucleaire, and Rio Algom Mines Ltd.

NONMETALS

Diamond.—CDM, a wholly-owned subsidiary of DeBeers Consolidated Mines Ltd., continued to be the largest contributor to the Territory's mineral industry. In 1975, the tonnage treated at Oranjemund increased to 12.2 million tons, and the grade rose sharply from 0.1326 to 0.1427 carat per ton. Final diamond recovery was thus 1.75 million carats, nearly 200,000 carats higher than the 1974 level. Overburden stripping was also increased over 1 million tons to total 46 million tons in 1975.

CDM has mining rights until the year 2010 in an 8,000-square-kilometer area stretching along the coast from the Orange River to Luderitz. Development of the Western Block, an area a few kilometers north of the mouth of the Orange River, has involved extensive overburden removal to expose underlying diamondiferous gravels. The installation of a bucket wheel excavator and conveyer bridge system in 1975 brought capacity to 1,000 cubic meters of overburden per hour. This allowed construction of a seawall, permitting mining 120 meters seaward of the high-water mark and to a depth of 90 meters below mean sea level. On the processing side, the No. 2 conglomerate treatment plant was commissioned in early 1975 and operated throughout the year at the capacity rate of 160,000 tons per month. The 172,000-ton-per-month No. 3 plant was to start up in 1976. Also in operation during 1975 was a new X-ray recovery facility designed to eventually treat concentrates from all four of the major treatment plants.

Salt.—SWACO began production at the Otjivalunda salt pans on a preliminary basis in 1975. Preparation for the mining of natural trona (sodium carbonate) and thenardite (sodium sulfate) commenced in 1974, but excessive rains brought mining and transport operations to a standstill. In 1975, approximately 2,000 tons of trona and 250 tons of thenardite were produced, with the major part of output being transported to Tsumeb for sale. Further development of the salt operations depended on the procurement of markets and the provision of an all-weather road from Otjivalunda to Ondangwa.

MINERAL FUELS

Petroleum.—The overall outlook for oil and gas exploration activity in the Territory was negative in 1975, as a number of oil companies relinquished their rights due to lack of commercial discoveries. The Southern Oil Exploration Corp. (South-West Africa) (Pty.) Ltd., (SWAKOR), the state agency responsible for the coordination of oil exploration, reported that there was no drilling activity in 1975.

Getty Oil Co. announced the termination of exploration activities of a three-company group which held a 34,110-square-kilometer offshore lease. Getty Oil (Walvis Bay) Ltd. (25%), a wholly-owned subsidiary of Getty Oil Co., and subsidiaries of Phillips Petroleum Co. (37.5%) and Continental Oil Co.

(37.5%), had been conducting geological and geophysical surveys in the deepwater area since 1972. Chevron Oil Co. of South-West Africa, a wholly-owned subsidiary of Standard Oil Co. of California, relinquished its offshore tract which it operated in conjunction with Regent Petroleum of the Republic of South Africa. This included an area approximately 180 kilometers west of the mouth of the Orange River where gas was discovered in 1974. Kuda 9A–1 was abandoned at 14,606 feet after gas tested from Lower Cretaceous sands proved noncommercial. The Milford Argosy Corp. (United States) relinquished rights in deepwater areas covering about 27,000 square kilometers.

In other leasing action, Canadian Southern Petroleum Ltd. increased its interest to 10% in a permit covering 13,000 square kilometers near the mouth of the Orange River, which it holds with Damson Oil Co., Aminex Ltd., and Asmera Ltd., all of Canada, and Aracca Petroleum Co. of the United States. The other remaining concessions were two awarded by SWAKOR in 1972 under terms which required an expenditure of $1.2 million in the first year and drilling after the third year. These were a 58,000-square-kilometer area in two blocks held by Aquitaine South-West Africa, and a 50,000-square-kilometer area directly offshore between Walvis Bay and the Cunene River held by B.J.H. duPreez.

The Mineral Industry of Spain

By Roman V. Sondermayer [1]

During 1975, Spain remained among the important producers of nonmetals, metals, and petroleum refinery products in Europe. The more prominent minerals, with production expressed in percentages of the world production, were as follows: Mercury, 20%; pyrite, 10%; fluorspar, 9%; strontium, 9%; gypsum, 7%; magnesite, 3%; lead, 3%; potash, 3%; feldspar, 3%; and zinc, 2%.

Production of other minerals and fuels was of only domestic significance. Domestic output of nonferrous ores, iron ores, and fuels did not meet demand. The mineral industry of Spain produced about 10% of the gross national product (GNP) of $101,050 million [2] at current prices. However, the share of the extractive sector of the mineral industry was less than 1% of the GNP. The general economic situation was characterized by unemployment averaging 5.4% and by an increase in the cost of living of 14.1% during the year.

As a consequence of a long-standing national policy aimed at developing mineral resources, a high rate of investment continued. In 1975, new investment in all mineral industry amounted to $458.7 million. Investment in mining of metallic ore ($200 million) almost doubled compared with that of 1974. Investments in the coal industry amounted to $163 million, $73 million over the 1974 figure, and investments in exploration for crude oil reached $88 million, twice the 1974 figure. The sharp increases in investments in prospecting for energy resources reflected the country's deficit position in energy supply.

The Mining Promotion Law (draft) and the National Fuels Plan were approved by the Government during 1975. The Mining Promotion Law is expected to constitute the basis for future development of the national mining sector. The draft contains several innovations. The most important were as follows: Compulsory preparation of a 4-year National Plan for the supply of minerals; a decision to set up a geological and mining data bank; regulation of activities abroad; financing of mining; and revision of the tax system for mineral industry. The approved 1976 National Fuels Plan (in addition to production targets) includes norms and provisions governing the supply of different fuels: Liquid and gaseous hydrocarbons, coal, and nuclear fuels.

There were a number of significant developments during 1975. Construction began on a 175,000-ton-per-year aluminum plant and on an 800,000-ton-per-year alumina plant near San Ciprian (Province of Lugo). Development continued at the Aznalcollar (Sevilla) mining complex. Discovery of a new iron ore deposit was announced near Granada. Development started on lead and zinc deposits near Rubales, and construction began on a 50,000-ton-per-year lead smelter. The discovery of two offshore oilfields was announced near the Tarraco oilfield. A new 7-million-ton-per-year petroleum refinery at Tarragona became fully operational in March 1975.

PRODUCTION

Spain continued to develop new domestic mineral resources. In addition, renovation of installations and introduction of modern equipment throughout the industry continued. The aim was to increase production of ores and concentrates and, consequently, cut imports of raw materials needed for the growing mineral processing and refining in-

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[2] Where necessary, values have been converted from Spanish pesetas (Ptas) to U.S. dollars at the rate of Ptas68=US$1.00.

dustry. Mine operations were characterized by low levels of mechanization and atomized operations. This situation resulted mostly from difficult geological and mining conditions. However, many metallurgical and petroleum processing plants were of modern design. As table 1 shows, trends in output were mixed. In spite of the recession, outputs of some commodities during 1975 were higher than during 1974.

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

Commodity	1973	1974	1975 p
METALS			
Aluminum:			
Bauxite	8,200	9,200	8,500
Metal:			
Primary	167,867	188,795	209,618
Secondary	51,506	43,848	35,000
Antimony:			
Mine output, metal content	114	134	84
Metal (regulus)	560	600	526
Bismuth, mine output, metal content ------- kilograms	r 720	r e 500	--
Cadmium metal	136	178	206
Copper:			
Mine output, metal content	r 38,483	34,298	21,360
Metal:			
Blister	94,422	129,226	142,775
Refined, primary:			
Thermal	19,101	24,516	17,472
Electrolytic	83,879	121,188	121,164
Total	102,980	145,704	138,636
Refined, secondary	23,506	25,206	NA
Gold, smelter output, primary ------------- troy ounces	18,905	31,829	50,541
Iron and steel:			
Iron ore and concentrate, gross weight thousand tons	r 6,621	8,238	8,218
Pig iron ------- do	6,272	6,887	6,843
Electric furnace ferroalloys ------- do	241	266	285
Crude steel ------- do	10,809	11,646	11,261
Semimanufactures ------- do	r 9,436	11,033	10,169
Lead:			
Mine output, metal content	r 64,525	64,127	57,768
Metal:			
Primary	87,322	79,529	73,349
Secondary	3,920	6,054	NA
Manganese ore and concentrate	r 6,792	--	--
Mercury:			
Mine output, metal content -------- 76-pound flasks	r 58,464	54,354	e 51,000
Metal ------- do	62,069	55,045	47,050
Silver:			
Mine output, metal content --- thousand troy ounces	r 4,157	4,099	e 4,100
Metal:			
Primary ------- do	2,990	2,894	3,525
Secondary ------- do	2,067	e 2,050	e 2,050
Tin:			
Mine output, metal content	r 523	643	530
Metal:			
Primary	r 5,816	5,862	8,042
Secondary	r 276	160	e 300
Titanium:			
Ilmenite concentrate:			
Gross weight	r 5,416	--	--
Titanium dioxide content	r 2,545	--	--
Titanium dioxide	19,940	20,023	17,143
Tungsten, mine output, metal content	r 394	438	420
Uranium, mine output, U_3O_8 content	r 94	73	122
Zinc:			
Mine output, metal content	r 94,223	94,759	84,136
Metal:			
Primary	107,070	130,006	133,365
Secondary	86	30	e 30
NONMETALS			
Barite	r 123,719	103,962	e 100,000
Cement, hydraulic:			
Natural ------- thousand tons	127	e 130	NA
Other ------- do	21,672	23,660	23,970

See footnotes at end of table.

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

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Chalk ---- cubic meters	r 103,700	151,200	e 160,000
Clays:			
Bentonite	47,629	75,917	e 80,000
Kaolin, marketable:			
Crude	53,593	51,404	e 50,000
Washed	136,384	202,057	e 200,000
Refractory	342,611	447,627	e 500,000
Other ---- thousand cubic meters	r 6,446	6,847	e 7,000
Diatomite and tripoli	r 19,358	27,297	e 30,000
Earths, industrial, n.e.s	r 20,346	20,499	21,000
Feldspar and pegmatite	r 58,575	72,296	e 75,000
Fertilizer materials:			
Crude, natural phosphates [1]	700,000	2,168,000	2,760,000
Crude potash salts, K_2O equivalent	570,614	495,282	509,715
Manufactured:			
Nitrogenous, nitrogen content ---- thousand tons	757	718	896
Phosphatic, P_2O_5 content ---- do	r 420	488	465
Potassic, K_2O equivalent ---- do	474	396	271
Fluorspar:			
Gross weight:			
Acid grade [2]	r 239,824	252,630	247,318
Metallurgical grade	100,675	107,944	e 125,000
Total	r 340,499	360,574	e 372,318
Calcium fluoride content:			
Acid grade [2]	r 233,212	245,652	239,365
Metallurgical grade	76,370	83,182	e 90,000
Total	r 309,582	328,834	e 329,365
Gypsum and anhydrite, crude ---- thousand tons	r 4,191	4,077	e 4,100
Kyanite and related materials, andalusite	r 6,728	7,311	e 7,400
Lime (quicklime and hydrated lime) ---- thousand tons	342	r e 345	e 345
Magnesite, crude	r 239,826	265,310	e 270,000
Meerschaum (sepiolite), crude	r 45,395	70,331	e 90,000
Pigments, mineral, ocher	r 56,145	57,855	e 58,000
Pumice	177,218	192,116	e 200,000
Pyrite including cupreous:			
Gross weight ---- thousand tons	r 2,368	2,827	2,646
Sulfur content ---- do	r 1,113	1,308	1,227
Salt:			
Rock ---- do	3 r 1,462	3 1,625	e 1,670
Marine and other evaporated ---- do	735	632	e 600
Sand and gravel:			
Sand, silica ---- thousand cubic meters	4 r 740	4 1,081	e 1,200
Other ---- do	r 8,756	13,626	e 15,000
Sodium compounds:			
Sodium carbonate, manufactured	441,700	481,650	473,124
Sodium sulfate:			
Natural:			
Glauberite, Na_2SO_4 content	r 40,774	43,902	e 46,000
Thenardite, Na_2SO_4 content	r 80,527	85,370	e 87,000
Manufactured	r 116,440	118,000	120,000
Stone:			
Calcareous:			
Dolomite ---- thousand cubic meters	r 998	1,332	NA
Limestone ---- do	r 34,317	36,200	NA
Marble ---- do	r 206	205	NA
Marl ---- do	r 2,525	2,854	NA
Basalt ---- do	r 581	653	NA
Diabase ---- do	(5)	--	NA
Granite ---- do	r 2,635	2,462	NA
Ofite ---- do	r 172	226	NA
Phonolite ---- do	r 197	221	NA
Porphyry ---- do	r 121	126	NA
Quartz ---- thousand tons	r 518	542	NA
Quartzite ---- thousand cubic meters	r 314	236	NA
Sandstone ---- do	r 585	735	NA
Serpentine ---- do	r 44	43	NA
Slate ---- do	r 373	527	NA
Trachyte ---- do	r 245	44	NA
Trass and tufa ---- do	r 217	256	NA
Strontium minerals	8,000	8,500	e 8,500

See footnotes at end of table.

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

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Sulfur, byproduct:			
Elemental from petroleum	1,588	e 1,600	e 1,600
From lignite gasification	1,381	e 1,400	e 1,400
From metallurgy	110,000	e 110,000	e 110,000
Talc and steatite	40,134	54,988	e 60,000
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	r 17,045	17,690	e 18,000
Carbon black	50,183	54,755	40,862
Coal:			
Anthracite thousand tons	r 2,989	2,948	3,079
Bituminous do	6,976	7,391	7,490
Lignite do	r 2,989	2,882	3,380
Total do	r 12,954	13,221	13,949
Coke, metallurgical do	4,467	4,333	4,861
Fuel briquets, all types do	147	108	12
Gas:			
Natural marketed million cubic feet	114	35	42
Manufactured:			
Gas works do	25,850	25,886	e 26,000
Coke ovens do	62,719	62,330	e 62,000
Blast furnaces do	94,601	99,780	e 100,000
Total do	183,170	187,996	e 188,000
Peat	r 14,491	26,345	e 30,000
Petroleum:			
Crude thousand 42-gallon barrels	5,932	14,334	14,822
Refinery products:			
Gasoline, motor do	38,639	38,501	40,077
Jet fuel do	15,697	15,265	17,157
Kerosine do	1,778	1,518	1,940
Distillate fuel oil do	72,764	71,735	62,720
Residual fuel oil do	133,658	144,310	139,716
Lubricants, including grease do	1,874	1,984	1,734
Other do	41,524	41,074	36,497
Refinery fuel and losses do	15,000	17,444	17,083
Total do	320,934	331,831	316,924

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Production from Spanish Sahara.
[2] Data presented includes recorded production of salable acid grade fluorspar from both fluorspar mines and lead-zinc-fluorspar mines, plus some salable acid grade fluorspar obtained by beneficiating a portion of total reported salable metallurgical grade output.
[3] Series revised to include byproduct output from potash works, not previously included.
[4] Includes sand obtained from the washing of kaolin in cubic meters as follows: 1973—143,936; 1974—250,246.
[5] Revised to none.

TRADE

During 1974, Spain's balance of foreign trade was negative. Imports of ores, concentrates, and fuels, especially crude oil, contributed largely to the deficit. African and Middle Eastern countries were the largest suppliers of minerals. Value of mineral imports was reported at $5,447 million. Crude oil accounted for 55% of mineral imports. Minerals exports, consisting mostly of various forms of metals, and petroleum refinery products totaled $1,850 million. European countries were the principal purchasers of Spanish mineral industries' products. Tables 2 and 3 show Spanish foreign trade in minerals.

Table 2.—Spain: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Oxide and hydroxide	38	60	Portugal 34; Bolivia 25.
Metal including alloys:			
Scrap	68	264	West Germany 254.
Unwrought	1,164	2,485	Portugal 1,843; Japan 499.
Semimanufactures	8,967	10,049	Portugal 1,703; United States 1,696.
Antimony metal including alloys, all forms	243	231	France 120; Belgium-Luxembourg 90; United States 20.
Arsenic:			
Trioxide, pentoxide, and acids	123	(1)	All to Andorra.
Metal including alloys, all forms	2	(1)	All to Netherlands.
Beryllium metal including alloys all forms kilograms	85	--	
Bismuth metal including alloys, all forms do	15	22	Panama 13.
Cadmium metal including alloys, all forms	33	40	Netherlands 27; United States 12.
Chromium:			
Oxide and hydroxide	28	33	Portugal 12; Costa Rica 7; Venezuela 7.
Metal including alloys, all forms	--	10	All to Netherlands.
Copper:			
Ore and concentrate	1,324	3,909	All to West Germany.
Matte	--	1,275	Belgium-Luxembourg 1,230.
Copper sulfate	(1)	(1)	Mainly to Ecuador.
Metal including alloys:			
Scrap	1,390	176	Japan 90; United Kingdom 44; West Germany 20.
Unwrought	9,348	7,163	France 3,308; West Germany 1,552; Netherlands 1,199.
Semimanufactures	4,178	5,881	Romania 1,145; Portugal 766.
Gold metal, worked and partly worked: troy ounces	3,054	--	
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	1,661	2,962	West Germany 1,112; France 474; Netherlands 399.
Roasted pyrite do	531	516	West Germany 505.
Metal:			
Scrap	2,832	2,333	Belgium-Luxembourg 1,621; West Germany 251.
Sponge iron, powder, shot	25,881	5,857	Italy 970; Portugal 855; West Germany 698.
Ferroalloys:			
Ferromanganese	29,431	35,943	United States 13,226; Romania 8,300; France 3,800.
Other	30,724	49,225	United States 16,383; West Germany 12,249; United Kingdom 5,300.
Steel, primary forms	526,986	66,258	France 7,379; United Kingdom 7,179; Belgium-Luxembourg 5,882.
Semimanufactures:			
Bars, rods, angles, sections	717,803	391,908	Poland 81,062; U.S.S.R. 57,108; Iran 46,495.
Universals, plates, sheets	311,848	100,490	West Germany 28,267; United Kingdom 22,767; United States 13,696.

See footnote at end of table.

Table 2.—Spain: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Semimanufactures—Continued			
Hoop and strip	11,222	5,868	People's Republic of China 1,583; Romania 948; Bulgaria 946.
Rails and accessories	5,231	164	Poland 100; West Germany 46.
Wire	10,005	7,140	Morocco 1,230; France 1,161; United States 790.
Tubes, pipes, fittings	129,204	87,910	West Germany 32,375; France 15,562.
Castings and forgings, rough	4,848	6,964	West Germany 1,987; Canada 1,407; United States 922.
Lead:			
Oxides	10	8	Portugal 6; Andorra 1.
Metal including alloys:			
Scrap	54	--	
Unwrought	38	342	Denmark 213; United States 61; France 49.
Semimanufactures	1,206	274	Netherlands 251.
Manganese:			
Ore and concentrate	48	144	Portugal 76; France 44; Netherlands 22.
Oxides	--	341	France 240; Yugoslavia 55; Romania 45.
Metal	30	18	All to Netherlands.
Mercury ———— 76-pound flasks	47,660	39,045	India 8,254; West Germany 6,295; United States 6,266; United Kingdom 5,367.
Molybdenum metal including alloys, all forms ———— kilograms	(1)	909	Netherlands 139; Portugal 29; Panama 13.
Nickel metal including alloys:			
Scrap	85	333	France 201; West Germany 93; Belgium-Luxembourg 35.
Unwrought	78	180	Netherlands 87; United Kingdom 53; West Germany 30.
Semimanufactures	27	35	Netherlands 15; Italy 14.
Platinum-group metals and silver:			
Waste and sweepings — kilograms	364	--	
Metal including alloys:			
Platinum group — troy ounces	(1)	3,247	Netherlands 2,829; West Germany 418.
Silver — thousand troy ounces	1,102	1	All to Switzerland.
Selenium, elemental ———— kilograms	950	--	
Tantalum metal including alloys, all forms ———— do	2	--	
Tin:			
Ore and concentrate	94	--	
Metal including alloys:			
Scrap	(1)	43	All to United Kingdom.
Unwrought	589	1,643	Netherlands 1,549.
Semimanufactures	4	3	Portugal 2.
Titanium:			
Oxides	2,347	2,249	Romania 700; Bulgaria 500; U.S.S.R. 500.
Tungsten:			
Ore and concentrate	439	470	West Germany 175; United Kingdom 140; United States 87.
Metal including alloys, all forms	1	57	United Kingdom 41.
Vanadium:			
Oxides	2	--	
Metal including alloys all forms kilograms	20	--	
Zinc:			
Ore and concentrate	6,928	10,492	France 5,098; West Germany 2,440; Italy 2,024.
Oxides	324	162	West Germany 150.
Metal including alloys:			
Scrap	99	82	West Germany 61; France 20.
Blue powder	19	10,214	United States 10,149.
Unwrought and semimanufactures	2,292	2,920	Netherlands 1,432; United States 409.
Other:			
Ore and concentrate of molybdenum, tantalum, titanium, vanadium, zirconium	34	405	Sweden 214; Netherlands 119; United States 45.

See footnote at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Other—Continued			
Ash and residue containing nonferrous metals	5,160	19,559	East Germany 10,934; West Germany 4,091; Republic of South Africa 3,419.
Oxides, hydroxides, peroxides of metals, n.e.s	320	426	Portugal 303; Netherlands 91.
Metals including alloys, all forms:			
Alkali, alkaline-earth, rare-earth metals	28	5	All to Japan.
Pyrophoric alloys	1	2	All to France.
Base, metals, including alloys, all forms, n.e.s	1	5	United Kingdom 4; Portugal 1.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	13,593	2,091	West Germany 1,042; Algeria 601; United Kingdom 242.
Dust and powder of precious and semiprecious stones (except diamond) ---- value, thousands	--	$(1)	All to Andorra.
Grinding and polishing wheels and stones	1,506	17,933	West Germany 733.
Asbestos	1	16	Morocco 11; Austria 5.
Barite and witherite	82,105	67,534	West Germany 54,916; Italy 8,580; United Kingdom 3,675.
Boron materials, oxides, acid	43	159	France 29; Belgium-Luxembourg 26; West Germany 24.
Cement ---- thousand tons	1,279	1,746	Algeria 979; United States 286; Israel 140.
Chalk	10,145	3,056	Portugal 1,544; Libya 850; France 642.
Clays and clay products (including all refractory brick):			
Crude clays n.e.s.:			
Bentonite	16,452	18,857	Portugal 4,334; France 3,843; West Germany 3,310.
Kaolin (china clay)	62,699	61,973	West Germany 23,006; Italy 19,276; France 9,074.
Other	15,860	15,411	Portugal 5,411; Andorra 4,881; Netherlands 1,357.
Products:			
Refractory, including nonclay brick	6,765	7,939	Cuba 3,534; Brazil 1,840; Algeria 1,042.
Nonrefractory	148,223	178,647	France 34,385; West Germany 33,095.
Diamond, natural and synthetic:			
Gem, not set or strung value, thousands	$38	--	
Industrial including powder do	$36	$78	Mainly to Mexico.
Diatomite and other infusorial earth	1,357	5,656	France 4,256; Portugal 1,000; Lebanon 400.
Feldspar, leucite, nepheline, nepheline syenite	1,346	1	All to Andorra.
Fertilizer materials:			
Crude and manufactured:			
Nitrogenous	170	86,374	Brazil 43,208; Venezuela 11,000; Taiwan 10,602.
Phosphatic	142,234	(1)	All to Australia.
Potassic	310,383	230,813	Norway 80,732; Portugal 51,755; Algeria 33,830.
Other	24,400	135,350	Philippines 37,450; Morocco 31,965; United States 28,093.
Ammonia	2,296	12	Mauritania 11.
Fluorspar	239,705	--	
Graphite, natural	--	1	All to Argentina.
Gypsum and plasters	146,044	211,540	Sweden 100,700; Denmark 57,648.
Iodine	2	2	Portugal 1; Venezuela 1.
Lime	5,239	4,399	Guinea 3,444; Andorra 339.
Magnesite	67,367	72,305	United Kingdom 43,177; West Germany 20,019; France 2,725.
Mica, all forms	183	250	Italy 73; West Germany 68; United Kingdom 28.
Pigments, mineral, including processed iron oxides	11,009	15,503	United Kingdom 1,922; United States 1,597.

See footnote at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Precious and semiprecious stones, except diamond:			
Natural ________ value, thousands __	$29	$69	Mainly to France.
Manufactured ____________ do ____	$229	$211	Mainly to Switzerland.
Pyrite (gross weight) thousand tons __	308	203	Belgium-Luxembourg 156; Denmark 19.
Salt and brine ______________ do ____	3	2	All to United Kingdom.
Sodium and potassium compounds n.e.s _	8,437	36,606	Brazil 9,987; Argentina 7,471; Egypt 4,805.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous ________________	16,701	15,967	Italy 12,125.
Slate ____________________	1,505	1,186	West Germany 943; Andorra 116.
Other ____________________	28,650	44,519	Italy 30,704; France 8,406.
Worked:			
Slate ____________________	64,244	86,234	France 75,348.
Paving and flagstone ______	(1)	40	United Kingdom 16; France 14; Zambia 9.
Other ____________________	18,444	15,909	West Germany 12,137; France 1,715.
Dolomite ______________________	36,870	44,526	United Kingdom 39,848.
Gravel and crushed rock __________	53,234	35,232	Andorra 29,589; Portugal 4,160.
Quartz and quartzite _____________	115,198	167,471	Norway 115,368; Sweden 42,062.
Sand excluding metal bearing ______	49,352	59,959	Andorra 57,249.
Sulfur:			
Elemental, all forms ______________	988	772	France 617; Morocco 145.
Sulfur dioxide __________________	10	24	All to Portugal.
Sulfuric acid ___________________	3,439	70,357	Turkey 34,023; Romania 14,207; Brazil 10,348.
Talc, steatite, soapstone, pyrophyllite ___	140	183	Italy 142; Colombia 18.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet ________	r 47,410	60,900	France 19,921; United Kingdom 15,566; West Germany 14,589.
Other ______________________	152,739	305,590	France 228,002; Belgium-Luxembourg 37,908.
Slag, dross and similar waste, not metal bearing ______________	3,994	39,793	Portugal 38,570.
Oxides and hydroxides of magnesium, strontium, barium ___	502	852	United States 368; West Germany 332.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s _________	29,222	34,475	France 19,759; Cuba 8,583.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural __________	--	(1)	All to Mauritania.
Carbon black and gas carbons __________	6,062	--	
Coal and briquets:			
Anthracite and bituminous coal ____	7,630	70,874	Belgium-Luxembourg 12,154; Liberia 11,665; West Germany 11,045.
Briquets of anthracite and bituminous coal ________________	--	980	All to West Germany.
Lignite and lignite briquets ________	626	122	All to Andorra.
Coke and semicoke ___________________	2,195	15,236	Portugal 12,015; France 2,564.
Hydrogen, helium, rare gases __________	6	9	Portugal 7; Algeria 2.
Peat including peat briquets and litter __	350	112	All to Portugal.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels __	103	1,441	France 787; Italy 391; West Germany 264.
Refinery products:			
Gasoline, including natural do ____	7,436	8,009	West Germany 2,034; United Kingdom 1,057; France 1,028.
Kerosine and jet fuel do ____	407	1,678	Syria 608; United States 326; Zaire 217.
Distillate fuel oil _____ do ____	17,259	19,774	West Germany 7,620; Netherlands 1,907.
Residual ____________ do ____	12,293	4,490	United States 852; Brazil 468.
Lubricants __________ do ____	104	108	Cuba 27; United Kingdom 24; Belgium-Luxembourg 16.
Other:			
Liquefied petroleum gas do ____	237	215	Algeria 127; France 55; Morocco 32.

See footnotes at end of table.

Table 2.—Spain: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other—Continued			
Mineral jelly and wax thousand 42-gallon barrels	7	23	Netherlands 10.
Bitumen and other residues do	427	925	Libya 423; Algeria 210; Portugal 110.
Bituminous mixtures, n.e.s do	127	294	Libya 159; Sudan 35; Congo 35.
Pitch and pitch coke do	42	64	France 59.
Unspecified do	83	11	All to Cuba.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	15,991	7,332	Belgium-Luxembourg 3,064; Argentina 1,967; France 854.

[r] Revised.
[1] Less than ½ unit.

Table 3.—Spain: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	108,839	132,374	Guyana 54,694; Greece 42,053.
Oxide and hydroxide	326,770	399,779	Guinea 158,886; France 84,089; Jamaica 78,933.
Metal including alloys:			
Scrap	3,453	4,439	West Germany 1,803; Portugal 1,293.
Unwrought	25,541	27,443	Norway 12,579; Ghana 4,408.
Semimanufactures	9,123	12,752	West Germany 2,215; Canada 1,836; France 1,286.
Antimony:			
Ore and concentrate	306	1,709	Norway 800; Morocco 750.
Metal including alloys, all forms	367	319	Belgium-Luxembourg 90; Czechoslovakia 83; United States 46.
Arsenic:			
Trioxide, pentoxide, acids	547	421	All from France.
Metal including alloys, all forms	16	7	All from Sweden.
Beryllium metal including alloys, all forms kilograms	5	1	All from West Germany.
Bismuth metal including alloys, all forms	103	81	West Germany 35; Mexico 34; United Kingdom 10.
Cadmium metal including alloys, all forms	1	--	
Chromium:			
Chromite	89,690	84,597	Turkey 52,953; Finland 9,027.
Oxide and hydroxide	357	467	West Germany 140; United States 113; U.S.S.R. 82.
Metal including alloys, all forms	18	55	United Kingdom 38; Japan 16.
Cobalt oxide and hydroxide	148	194	Belgium-Luxembourg 88; United States 37; Canada 36.
Copper:			
Ore and concentrate	115,457	128,689	Australia 62,590; Ireland 27,785.
Matte	14,408	8,417	Israel 4,038; Chile 3,609.
Copper sulfate	908	2,187	France 866; U.S.S.R. 319; Hungary 300.
Metal including alloys:			
Scrap	18,419	11,926	France 4,092; United States 2,185; West Germany 1,401.
Unwrought	50,578	79,687	Chile 10,033; Belgium-Luxembourg 9,003; Zambia 8,677.
Semimanufactures	16,871	14,510	West Germany 2,548; Sweden 2,096; United Kingdom 2,067.
Gold:			
Waste and sweepings kilograms	509	149	All from West Germany.
Metal, worked or partly worked thousand troy ounces	804	198	West Germany 195.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Iron and steel:			
Ore and concentrate, excepted roasted pyrite ---- thousand tons --	5,116	5,280	Brazil 1,303; Venezuela 896; Sweden 730.
Roasted pyrite ----	--	(1)	All from France.
Metal:			
Scrap ---- thousand tons --	2,012	1,925	United States 950; United Kingdom 186; France 135.
Pig iron including cast iron do ----	43	24	Norway 1; Switzerland 1.
Sponge iron, powder, shot do ----	8	10	Sweden 7; France 2; West Germany 1.
Ferroalloys ---- do ----	26	23	Republic of South Africa 7; French Oceania 3.
Steel, primary forms -- do ----	173	416	West Germany 93; Greece 66; Belgium-Luxembourg 49.
Semimanufactures:			
Bars, rods, angles, shapes sections ---- do ----	173	157	West Germany 43; France 17; Italy 16.
Universals, plates, sheets ---- do ----	403	248	West Germany 61; France 54; United Kingdom 41.
Hoop and strip --- do ----	74	44	France 17; West Germany 13; Belgium-Luxembourg 5.
Rails, and accessories do ----	3	15	Belgium-Luxembourg 7; West Germany 2; France 2; United States 2.
Wire ---- do ----	15	6	West Germany 2.
Tubes, pipes, fittings ---- do ----	47	43	West Germany 12; France 12; United Kingdom 8.
Castings and forgings, rough ---- do ----	11,178	6	West Germany 2; France 1; Belgium-Luxembourg 1.
Lead:			
Ore and concentrate ----	33,012	41,638	Morocco 26,743; Poland 10,191; Canada 4,704.
Oxides ----	452	704	United Kingdom 360; France 259; Bulgaria 78.
Metal including alloys:			
Scrap ----	984	1,214	United States 938.
Unwrought ----	6,344	22,663	West Germany 8,193; United States 4,272.
Semimanufactures ----	140	100	West Germany 70; France 11.
Magnesium metal including alloys, all forms ----	953	840	United States 567.
Manganese:			
Ore and concentrate ----	331,098	384,103	Republic of South Africa 155,677; Gabon 64,981; Brazil 61,060; Ghana 39,841.
Oxides ----	1,954	1,413	Japan 792; United States 347; People's Republic of China 160.
Metal ----	694	709	France 338; Japan 190; Republic of South Africa 152.
Mercury ---- 76-pound flasks --	15	13	Austria 6; West Germany 4.
Molybdenum metal including alloys, all forms ----	30	34	Austria 9; United States 9; Netherlands 5.
Nickel:			
Ore and concentrate ----	10	16,011	Australia 13,816.
Matte, speiss, similar materials ----	468	150	Canada 108; United Kingdom 24; Finland 17.
Metal, including alloys:			
Scrap ----	116	126	France 51; Italy 28; West Germany 19.
Unwrought ----	4,853	6,010	Canada 2,218; Cuba 1,726; United Kingdom 898.
Semimanufactures ----	2,037	2,571	France 1,049.
Platinum-group metals and silver:			
Ore and concentrate ----	--	6,438	Australia 5,006; United States 606.
Waste and sweepings ----	644	411	United States 355; France 47.
Metal including alloys:			
Platinum group - troy ounces --	(1)	(1)	Mainly from France.

See footnote at end of table.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Platinum-group metals and silver—Continued			
Metal including alloys—Continued			
Silver _ thousand troy ounces	11,413	8,359	Belgium-Luxembourg 1,951; West Germany 1,768; United Kingdom 1,557.
Rare-earth metals:			
Oxides	160	192	France 124; United Kingdom 63.
Metals including alloys	21	18	France 10; United States 6; Brazil 2.
Selenium, elemental	20	35	Japan 16; Yugoslavia 6; United States 5.
Silicon, elemental	440	311	Yugoslavia 303.
Tellurium, elemental	10	4	U.S.S.R. 3.
Tin:			
Ore and concentrate	5,351	6,156	Zaire 2,724; Bolivia 1,430.
Oxides	117	153	United Kingdom 87; West Germany 64.
Metal including alloys	111	109	United Kingdom 44; West Germany 25.
Titanium:			
Ore and concentrate	43,766	76,596	Norway 76,482.
Oxides	7,205	6,364	West Germany 3,225; France 978.
Tungsten:			
Ore and concentrate	348	11,206	Greece 11,186.
Metal including alloys, all forms	22	17	Austria 5; United Kingdom 4; France 2; Netherlands 2; Singapore 1; United States 1.
Uranium and thorium:			
Ore and concentrate (uranium) kilograms	434	4	France 4.
Oxides	2	14	France 12; United Kingdom 2.
Metal including alloys, all forms kilograms	561	461	Italy 313; United Kingdom 108.
Vanadium:			
Pentoxide do	19	389	Netherlands 100; United States 84.
Metal including alloys, all forms	10	5	United States 5.
Zinc:			
Ore and concentrate	55,830	126,404	Peru 61,026; Mexico 33,431; Canada 16,304.
Oxide and peroxide	906	2,119	Greece 998; France 461; West Germany 445.
Metal including alloys all forms	3,560	2,197	France 514; West Germany 410; Bulgaria 248.
Zirconium metal including alloys, all forms	8	1	All from France.
Other:			
Ore and concentrate:			
Of molybdenum, tantalum, titanium, vanadium, zirconium	15,987	32,449	Australia 18,822.
Of base metals n.e.s	272	588	Australia 320; Sri Lanka 101; United States 71.
Ash and residue containing nonferrous metals	131,682	95,266	Peru 70,278.
Oxides, hydroxides, peroxides of metals	1,518	1,723	West Germany 379; France 372.
Metals including alloys, all forms:			
Alkalai and alkaline earth	72	206	West Germany 198.
Pyrophoric alloys	10	15	West Germany 6; France 5; Austria 2.
Base metals including alloys, all forms, n.e.s	403	428	United States 149; Belgium-Luxembourg 82; France 55.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	809	2,423	Greece 1,524; United States 444; France 232.
Dust and powder of precious and semiprecious stones (except diamond) value thousands	$49	$47	United States $21; Ireland $10.
Grinding and polishing wheels and stones	1,339	1,732	West Germany 293; United Kingdom 266; Austria 255.
Asbestos	109,045	125,971	Republic of South Africa 50,424; Canada 46,846; West Germany 16,592.

Table 3.—Spain: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Barite and witherite	1,012	656	France 587.
Boron materials:			
Crude natural borates	58,139	81,110	Turkey 42,712; United States 38,383.
Oxides and acid	2,739	164	France 115; Italy 41.
Bromine	20	15	Israel 9; France 4; United States 1.
Cement	375,388	162,486	United Kingdom 126,179.
Chalk	6,907	7,360	France 5,895.
Clays and clay products including all refractory brick:			
Crude clays, n.e.s.:			
Bentonite	36,227	47,722	Morocco 17,715; Italy 16,006; United States 8,690.
Kaolin (china clay)	106,690	139,804	United Kingdom 101,300; France 16,870; United States 14,915.
Other	57,160	66,817	United Kingdom 31,867; France 15,416; Morocco 8,855.
Products:			
Refractory, including nonclay brick	31,577	27,799	Austria 10,114; West Germany 9,186.
Nonrefractory	32,433	38,050	Italy 20,114; West Germany 6,455; Portugal 5,693.
Cryolite and chiolite	1,520	3,925	Denmark 3,925.
Diamond:			
Natural and synthetic:			
Gem, not set or strung value, thousands	$6,203	$9,636	Mainly from Belgium-Luxembourg.
Industrial including powder do	$5,454	$4,326	Do.
Total do	$11,657	$13,962	
Manufactured industrial do	$4	$62	Mainly from U.S.S.R.
Diatomite and other infusorial earth	3,017	2,863	United States 1,450; France 1,244.
Feldspar, leucite, nepheline, nepheline syenite	14,390	16,448	France 12,970.
Fertilizer materials:			
Crude:			
Nitrogenous	40,617	39,902	All from Chile.
Phosphatic thousand tons	1,941	1,189	Morocco 1,107.
Potassic	1	1	All from France.
Manufactured:			
Nitrogenous	230,903	130,023	Netherlands 37,161; France 29,996.
Phosphatic	42,800	32,117	France 16,009; Belgium-Luxembourg 15,527.
Potassic	15,843	49,613	Congo 22,380; West Germany 17,706.
Other including mixed	27,013	20,221	Poland 9,122; Belgium-Luxembourg 4,311; West Germany 2,220.
Fluorspar	24	17	West Germany 7; Netherlands 6; Belgium-Luxembourg 3.
Graphite, natural	1,430	1,650	West Germany 641; Malagasy Republic 531.
Gypsum and plasters	1,381	2,891	United States 882; Morocco 862; France 661.
Iodine	53	61	Japan 40; Chile 20.
Lime	206	497	Morocco 212; France 162; Austria 100.
Magnesite	37,065	44,380	Greece 13,139; United Kingdom 5,193; Austria 4,130.
Mica, all forms	1,543	1,257	India 384; Norway 211; France 188.
Pigments, minerals, including processed iron oxides	4,164	4,476	West Germany 2,604; France 951.
Precious and semiprecious stones, except diamond:			
Natural:			
Gem value, thousands	$6,042	$8,171	Belgium-Luxembourg $2,921; Thailand $1,202; India $1,088.
Industrial do	$819	--	
Manufactured do	$561	$629	Switzerland $457; India $93.
Pyrite (gross weight)	169	140	Italy 101; United States 28.
Salt and brine	52,484	98,103	France 90,999.
Sodium and potassium compounds, n.e.s	32,717	92,950	France 54,628; Italy 17,554; West Germany 11,360.

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	63,399	81,008	Italy 47,408; Portugal 30,056.
Slate	90	16	All from West Germany.
Other	18,475	23,016	Norway 8,511; Finland 3,296; Sweden 3,252.
Worked:			
Slate	603	668	Italy 646.
Paving and flagstone	13	58	Belgium-Luxembourg 40; Italy 18.
Other	1,449	3,175	Italy 1,374; Portugal 1,332.
Dolomite, chiefly refractory grade	2,300	3,297	France 1,627; Norway 1,589.
Gravel and crushed rock	47,626	36,743	Morocco 29,163; France 5,536.
Quartz and quartzite	1,467	1,875	Sweden 1,119; Belgium-Luxembourg 412.
Sand, excluding metal bearing	290,895	185,078	Morocco 83,668; Belgium-Luxembourg 57,864.
Sulfur:			
Elemental:			
Other than colloidal	93,411	114,580	France 74,533; United States 26,729.
Colloidal	400	161	West Germany 160.
Sulfur dioxide	26	(1)	Mainly from Portugal.
Sulfuric acid	156,093	39,177	Belgium-Luxembourg 10,520; Poland 8,847; United Kingdom 5,690; Italy 4,773; Portugal 3,992.
Talc, steatite, soapstone, pyrophyllite	8,376	10,163	France 6,151; Norway 1,851.
Other nonmetals, n.e.s.:			
Crude: Other	55,100	58,441	Greece 14,681; U.S.S.R. 13,091; Australia 9,464.
Slag, dross, similar waste, not metal bearing	1,169	2,341	France 1,795; West Germany 463.
Oxides and hydroxides of magnesium, strontium, barium	6,446	1,103	France 451; United States 296; West Germany 268.
Fluorine	20	--	
Building materials of asphalt, asbestos and fiber cement, and unfired and nonmetals, n.e.s	2,217	2,322	France 1,333; Belgium-Luxembourg 448.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,230	1,031	United States 790; United Kingdom 144.
Carbon black and gas carbon	18,899	14,265	France 6,485; Netherlands 3,265; United States 2,406.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	3,056	3,245	United States 1,942.
Briquets of anthracite and bituminous coal	22	19	All from United Kingdom.
Lignite and lignite briquets	25,280	31,165	France 31,150.
Coke and semicoke	419,938	455,900	Italy 123,952; West Germany 109,265.
Gas, natural liquefied thousand cubic feet	63,146	54,702	All from Libya.
Hydrogen, helium, rare gases	1,260	1,139	Belgium-Luxembourg 1,072.
Peat, including peat briquets and litter	4,654	5,035	Finland 2,018; West Germany 1,011; Poland 569.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	305,260	307,246	Saudi Arabia 177,555; Algeria 23,473.
Refinery products:			
Gasoline, including natural do	857	457	Italy 198; Surinam 99; Netherlands 75.
Kerosine do	(1)	(1)	Mainly from United Kingdom.
Distillate fuel oil do	185	759	Italy 324; West Germany 190; U.S.S.R. 81.
Residual fuel oil do	2,911	7,029	Romania 2,189; Netherlands 1,701.
Lubricants do	523	424	United Kingdom 128; Netherlands 95; Belgium-Luxembourg 55.
Other:			
Liquefied petroleum gas do	3,669	7,482	France 3,948; Algeria 1,820; Italy 713.
White spirit do	13	4	France 2.
Mineral jelly and wax do	185	247	France 46; Netherlands 36; West Germany 33.

See footnote at end of table.

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

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other—Continued			
Bitumen and other residues -- thousand 42-gallon barrels --	173	12	France 11.
Bituminous mixtures, n.e.s ---- do ----	3	6	France 3; United Kingdom 2.
Pitch, pitch coke, petroleum coke ---- do ----	1,272	1,823	United States 1,153; West Germany 440; United Kingdom 223.
Unspecified ---- do ----	336	165	Netherlands 36; Belgium-Luxembourg 27; United States 20.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons --	132	167	United States 75; Surinam 19; Venezuela 18.

[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Complex sulfide ores, containing iron, copper, lead, and zinc were the principal sources of nonferrous metals in Spain. The tabulation below shows the number of mines producing a combination of various metals in Spain in 1975:

	Number of mines
Copper-iron-lead	5
Iron-pyrites-copper	13
Lead-zinc	19
Lead-zinc-pyrites	6
Lead-zinc-fluorspar	7
Gold-silver	1
Pyrite-copper	10

During 1975, production of metals was adversely affected by increased cost for power, labor, and transportation. In addition, some metal prices had a ceiling imposed by the Government. All of these factors made the economics of certain operations less profitable than in the past.

Aluminum.—During 1975, construction began on the alumina and aluminum complex at San Ciprian (Province of Lugo). The project called for the annual production of 800,000 tons of alumina and 175,000 tons of aluminum. The investor was Aluminio Español S.A. (formerly Aluminio de Villagarcía S.A.). Empresa Nacional de Aluminio (ENDASA) shared 55%; Aluminio de Galicia S.A. (ALUGASA), 20%; and others, 25%. In addition, ALUGASA announced plans to expand its 15,000-ton-per-year primary aluminum plant at Sabiñánego. However, capacity after expansion was not made public at yearend. Plans also were announced to expand ALUGASA's La Coruna smelter to 106,000 tons per year by 1978. The San Ciprian facility and other projects were part of the large program for expansion of aluminum-producing facilities in Spain from 216,000 tons in 1975 to 411,000 tons per year by 1980.

During 1975, four primary smelters were in operation with a combined capacity of 216,000 tons. The Government-owned company ENDASA was the major producer of aluminum in Spain and operated the country's largest smelter, a 110,000-ton-per-year plant near Aviles. The aluminum industry suffered from the stagnation of the economy; production of aluminum metal increased, but consumption declined. Consequently, stocks increased and reached record levels. Spain, with its modest production of bauxite, remained dependent on imports to meet the demand of domestic refiners.

Copper.—During 1975, development of the Aznalcóllar (Sevilla) mining complex, operated by Andaluza de Piritas S.A. (APIRSA), continued. According to reports, the open pit will be among the largest on the European continent. In addition to the mine, the mining complex includes a beneficiation plant, water supply system, and other auxiliary facilities. Planned production includes about 51,000 tons of copper concentrates, 42,000 tons of lead concentrates, and 98,000 tons of zinc. The proven reserves of the deposit amounted to

78.5 million tons of which approximately 44.5 million tons was complex sulfide ores (average metal content: 0.58% copper, 1.78% lead, 3.33% zinc, and 67 grams per ton of silver) and 34 million tons was pyritic cuprious ores (average metal content: 0.58% copper, 0.40% lead, and 10 grams per ton of silver). The yearly planned targets for the opencast operation were set at 2 million tons of pyrites and 1.5 million tons of copper ore with an overburden-to-ore ratio of 3.2 to 1. The beneficiation will include crushing and milling facilities, differential flotation systems for sulfides, and dewatering installations. The complex is scheduled to start production at yearend 1977 or early 1978. Before any large-scale mining starts, the Argio River will have to be diverted because it flows over a mineralized zone.

During 1975, there were 28 mines producing copper, but Spain remained dependent on imports of concentrates and matte to meet its demand. Five mines produced copper as main products; 10 pyrite mines produced copper as byproduct, and 13 mines produced copper as byproduct of iron output. Most of the copper mines were located in the Province of Huelva. There were four copper smelters and six copper refineries in operation during 1975. The largest smelter and refinery, with an annual capacity of 85,000 tons of copper each, were located in the Province of Huelva and were operated by Rio Tinto Patino, S.A.

Iron Ore.—Exploration was the focal point of the iron-ore-producing industry in Spain during 1975. A new deposit of iron ore was found in the Marquesdado zone of the Province of Granada in southern Spain near the Alquife mines. Reports indicated reserves of about 30 million tons of high-grade ore. The ore will probably be processed by a fourth Spanish integrated iron and steel plant at Sagunto, Valencia. An annual production of 1 million tons was planned for the new mine. In addition, exploration for iron ore was conducted by the Geological and Mining Institute. No new major discoveries were announced, but results confirmed the size of reserves proven in existing mines.

During 1975, about 30 iron ore mines were in operation in Spain. In addition, six nonferrous metal mines produced iron ore as a byproduct of their operations.

Four Provinces—Leon, Teruel, Vizcaya, and Guadalajara—had iron ore production over 500,000 tons per year.

Domestic production of iron ore was sufficient to meet only about 50% of demand.

Iron and Steel.—There were no new major events in the iron and steel industry of Spain during 1975. Empresa Nacional Siderúrgica S.A. (ENSIDESA) remained the principal steel producer in the country. ENSIDESA, with plants located at Aviles, La Felguera, Gijon-Moreda, and Gijon-Verina, accounted for approximately 70% of the country's pig iron production and about 46% of steel output.

There were no installations for direct reduction of iron ore in operation during 1975; however, two plants were planned by ENSIDESA, fundamental characteristics of which are as follows:

One installation will be located in northern Spain near the port of Bilbao. There will be two modules using natural gas as reductant. Capacity will be about 1 million to 1.2 million tons per year. The other facility will be located in the Bay of Algeciras, southern Spain. One module was planned, and the reductant will be manufactured gas. Annual capacity will be 500,000 tons. The exact process to be used in each project had not been determined at yearend 1975. Since projects are included in the new Concerted Action Program for Iron and Steel Metallurgy, they should be completed prior to December 31, 1980.

Lead and Zinc.—Highlights of lead and zinc mining in Spain in 1975 were development of the lead and zinc deposit near Rubiales in the Province of Lugo, expansion of San Juan de Nieva Zinc Smelter, and construction of a new lead smelter. At Rubiales, the underground mine was scheduled for production in 1977. Output of 2,600 tons of ore was planned. This should yield approximately 115,000 tons of zinc concentrates and 15,000 tons of lead concentrates per year. Proven reserves were reported at 7.5 million tons with an average zinc content of 9.9% and lead content of 1.7%. Future zinc concentrates from the new mines were scheduled for shipment to the zinc smelter, San Juan de Nieva, owned by Asturiana de Zinc S.A.; the lead concentrates will be smelted at a lead smelter near Cartagena owned by Société Minera Metalúrgica Peñarroya–España S.A. (Peñarroya). The development was financed by Cominco Ltd., 45%; Union Corporation of South Africa, 27%; and Asturiana de Zinc and Banco Urquijo S.A., 25%. In addition, lead and zinc concentrates will be produced at the new mining operation Aznalcóllar, Sevilla, described in the copper section of this chapter. Expansion continued on the zinc smelter at San Juan de Nieva, owned by Peñarroya. When completed in 1977, the smelter capacity will have been increased from 130,000 tons to 205,000 tons of zinc per year.

A 50,000-ton-per-year lead smelter was under construction near Linares at yearend. Startup was scheduled for 1976. Five companies were participating in the venture (Peñarroya, El Adaro, Los Guindos, Compania La Cruz S.A., and C. AR. M.).

During 1975 there were 19 lead mines, 19 lead and zinc mines, 6 zinc-lead-pyrite mines, and 7 zinc-fluorspar mines operating in Spain. Approximately 50% of the zinc produced in Spain was mined in the northern district near Santander. In addition, about 30% was mined in the district of Cartagena in southern Spain. Two zinc smelters and four lead smelters were operating at yearend 1975. Peñarroya was the largest producer of lead and operated the largest lead smelter in the country, located near Santa Lucia, Cartagena. Asturiana de Zinc was the major zinc producer in the country and operated the largest Spanish zinc plant, the San Juan de Nieva. At yearend, Spain's installed capacity for zinc production totaled 110,000 tons per year; the installed capacity for lead production was 106,000 tons per year. Spain was dependent on imports of lead and zinc raw materials to supplement domestic supply.

Other Metals.—No major events were registered in production of tin (17 mines), tungsten (8 mines), mercury (1 mine), and gold and silver (1 mine) during 1975. Except for mercury, which was produced in one of the largest mercury mines in the world (Almaden), output of all others was only of domestic significance.

NONMETALS

Spain produced a large variety of nonmetals. However, their importance was mostly limited to the domestic economy. The nonmetals contributed about 29% of the value of mining production of the country.

Cement.—Spain was among the world's principal exporters of cement during 1975. The production capacity of the Spanish cement industry, which was 26.8 million tons at yearend 1974, grew by 3.3 million tons by 1975. Plans call for an additional 3.9 million tons of installed capacity by yearend 1976, which will bring the total to 34 million tons. In principle, output of new facilities was not aimed at foreign markets. However, as a result of slowdowns in the construction industry, cement consumption in Spain was down by 6.2% from the 1974 level. Consequently, the surplus was exported, and Spain was among the largest exporters of cement in the world at yearend. The following companies were among the largest producers of cement in Spain during 1975: Cía. General de Asfaltos y Portland Asland S.A., Barcelona (4.2 million tons kiln capacity, seven plants); Portland Vardirrivas S.A., Madrid (2 million tons, two plants); Cementos Uniland S.A., Barcelona (1.9 million tons, two plants); Compania Valenciana de Cementos Portland S.A. (1.9 million tons, three plants).

Fertilizer Materials.—Four potash mines were in production during 1975. Three were located in the province of Barcelona, but one mine in Navarra accounted for about 43% of the output. Minas de Potasa de Suria has plans to increase annual output by 50,000 tons of K_2O and reach production of 200,000 tons per year in 1980. The program included development of a new mine in the Suria area.

Potasas de Navarra has announced plans to start producing from new zones within the potash deposit near Pamplona. Reportedly, capacities for carnalite beneficiation in the area will be increased to 150,000 tons of K_2O by 1978–79. Reserves near the shaft of Beriain were near exhaustion. The shaft will be dismantled in the future.

Other Nonmetals.—Recent trends in output of other nonmetallics are shown in table 1. For selected commodities the number of producing facilities are listed in the following tabulation:

Commodity	Number of facilities	Provinces with largest output and number of facilities
Andalusite	7	Coruna (all)
Barite	29	Cordoba (all)
Bentonite	9	Almeria (8)
Kaolin	123	Valencia (33) Teruel (24)
Feldspar	14	Avila (2) Madrid (2)
Fluorspar	20	Oviedo (10)
Gypsum	348	Jaen (33) Murcia (24) Zagora (22) Alicante (21)
Magnesite	3	Madrid (1) Lugo (1) Navarra (1)
Sand and gravel	526	Barcelona (97) Madrid (45) Burgos (32) Oviedo (27) Baleares (23)

There were no major events in the other nonmetallic facilities. Quarry output—building stone, crushed stone, and sand and gravel—accounted for 43% of the value of nonmetallics.

MINERAL FUELS

Petroleum, mostly imported, remained the principal source of energy in Spain. During 1975, about 81% of Spain's apparent energy consumption was met through imports. Crude oil and petroleum refinery products accounted for about 94% of energy imports. Coal was the principal source of energy produced in the country and provided 15% of apparent energy consumption. However, additional imports of high-rank coals were necessary to meet demand. Table 4 shows supply and apparent consumption of energy-producing materials for 1974 and 1975. Approximately 60,000 persons were employed in the fuel industry of Spain.

Table 4.—Spain: Supply and apparent consumption of energy-producing materials for 1974 and 1975

(Million tons of standard coal equivalent)[1]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Fuelwood	Hydroelectric power
1974:						
Production	19.1	11.8	2.9	(2)	(2)	4.4
Imports	68.8	3.6	65.2	(2)	(2)	(2)
Exports	7.1	.1	7.0	(2)	(2)	(2)
Apparent consumption	80.8	15.3	61.1	(2)	(2)	4.4
1975:						
Production	19.9	12.7	2.6	(2)	(2)	4.6
Imports	66.8	4.3	62.5	(2)	(2)	(2)
Exports	4.0	(2)	4.0	(2)	(2)	(2)
Apparent consumption	82.7	17.0	61.1	(2)	(2)	4.6

[1] 1 ton standard coal equivalent = 7,000,000 kilocalories.
[2] Less than 0.01 million tons of standard coal equivalent.

Coal.—Major activities in the coal industry were related to expansion of output and renovation of coal mines. As a direct result of the petroleum crisis, domestic coal became more attractive as a source of primary energy in Spain. Renewed emphasis was placed on the coal industry. The Government was stimulating developments of the coal industry through tax relief and credit policies. During 1975, a number of firms within the coal-mining sector entered into "Concerted Action Agreements" with the Spanish Government for the purpose of increasing coal production. These agreements call for an output of 33.7 million tons of coal by 1980. During 1975, Spain produced anthracite (69 mines), bituminous coal (39 mines), and lignite (34 mines). The Provinces of Oviedo and Leon were the largest producers of anthracite and bituminous coal. Most of the lignite was produced in the Provinces of Teruel, Barcelona, and Coruna.

Petroleum.—During 1975, domestic output of crude oil and natural gas was modest, and Spain remained almost totally dependent on imported crude oil and natural gas. Exploration, offshore and onshore, and processing remained focal points of the petroleum industry. Toward yearend, Spain's Hydrocarbons Bureau had received bids for seven offshore tracts recently offered for tender, one in the Bay of Biscay and the others in the Mediterranean Sea. The tracts were Mar Cantabrico H tract in the Bay of Biscay, Montanazo B tract in the Ebro

River Basin, Montanazo C & D tracts in the Ebro River Basin, Benicarlo tract off Caltelon Province, and Grumete A, B, & C blocks off Alicante Province.

Two significant discoveries were made offshore from Spain during 1975. The Chevron Group (made up of California Oil Co. of Spain, Pacific Petroleum Ltd., and Cía de Investigacion y Explotaciones Petroliferas S.A.) made a discovery on an offshore wildcat well on a lease located immediately east of Tarraco Field and 35 miles east of Amposta oilfield. The "1-Casablanca," in 132 meters of water, flowed about 147 tons of oil per day (1,074 barrels per day) from two zones at about 2,740 meters and 2,890 meters in depth. The oil is reportedly 31.2° API with low sulfur content.

Further tests indicated the possibility of production from deeper zones. The second discovery, E-1 Tarragona, which appears to be a major one, was made by Union Texas España, a subsidiary of Allied Chemical Corp. and Getty Oil Co. The wildcat well (E-1 Tarragona) was located 45 miles northwest of Shell's offshore Amposta Field, 16 miles from the Spanish shore. Further drilling was planned to determine the extent of the new deposit. To assure crude oil supply, Spain's State-owned Hispanoil was participating in various exploration ventures abroad. In Algeria, offshore Sicily, Peru, and Gabon, Hispanoil was involved in drilling for crude oil.

The new Tarragona refinery, which started production in December 1974, became fully operational in March 1975 with an annual capacity of 7 million tons. This new addition brings Spanish installed refinery capacity to 68.8 million tons (1,376,000 barrels per day).

A large new oil port was under construction near Bilbao, and partial operation started during 1975. The new port will have facilities for berthing ships up to 500,000 deadweight tons. It is expected that this port will change the general flow of crude from the Middle East to Europe by diverting some oil from northern Europe (Antwerp and Rotterdam) to southern Europe. Completion of construction is expected during 1977.

Two oilfields, one near Burgos, the other near Tarragona, (yearly output, 2 million tons) and 11 refineries (installed capacity, 68.8 million tons) were in operation in Spain during 1975. The following tabulation shows refineries with a capicity over 7.5 million tons per year:

Refinery location	Capacity (million tons)	Company
Escombreras	10.5	Empresa Nacional del Petroleo.
Santa Cruz de Tenerife	8.0	Compañía Española de Petroleos S.A. (Enpetrol).
Tarragona	7.8	Empresa Nacional del Petroleo (Enpetrol).
Puertollano	7.5	Empresa Nacional del Petroleo.

Retail prices for petroleum refinery products during 1974 and 1975 are shown below in U.S. cents per gallon except for bunker "C" fuel oil, which is given in U.S. cents per 42-gallon barrel.[3]

[3] U.S. Bureau of Mines. International Petroleum Annual, 1974. 1976, p. 36.

	July 1975	July 1974	Change percent
Motor gasoline:			
Regular	113.6	116.0	−2.1
Premium	129.8	139.0	−6.7
Household kerosine	64.9	60.0	+8.2
Motor lubricating oil	454.1	463.0	−2.0
Distillate fuel oil	34.5	NA	NA
Bunker "C" fuel oil	1,108.6	843.0	+31.5

NA Not available.

The modest domestic output of natural gas was far below the country's demand. Imports of liquefied natural gas were essential for adequate supply. Spain's Empresa Nacional del Gas (ENGAS) has signed a 20-year contract with SONATRACH of Algeria for a supply of up to 435 million cubic feet per day. Deliveries were expected to start in 1976. In addition, construction was underway to expand the Barcelona regasification plant to 240 million cubic feet per day.

Nuclear Energy and Uranium.—Spanish Government policy continued to aim at replacing oil with uranium by 1985–90 as the main fuel used in electric powerplants. Of a total of 37 existing and planned reactors, 3 were in use, 7 under construction, 6 contracted for, 1 licensed, and 20 more for which license applications had been submitted. If all these reactors are constructed, they will represent a total capacity of 34,275 megawatts of electric power by 1990. Table 5 shows details related to nuclear powerplants in Spain at yearend.[4]

Uranium ore reserves and resources are modest. Apparently, imports will be needed to supplement domestic output of U_3O_8 to meet requirements of nuclear powerplants in the future. However, the Government has started a nationwide exploration program for uranium to be carried out by the Spanish Institute of Geology and Mining and the Nuclear Energy Board. The goal was set to assure reserves that will support a production covering 50% of the country's demand at the end of 1985.

Uranium ores were mined and processed in two locations, Anudhar and Saelices el Chico-Ciudad Rodrigo, near Barcelona. Empresa Nacional del Uranio S.A. (ENUSA) managed uranium related activities in Spain. Expansion of the uranium mill at Ciudad Rodrigo continued. When completed in 1976, mill capacity was expected to be 120 tons per year of U_3O_8.

[4] U.S. Embassy, Madrid, Spain. State Department Airgram A-89, May 11, 1976, 2 pp.

Table 5.—Spanish nuclear reactors
(December 31, 1975)

Reactor	Installed capacity	Province	Status	Type	Actual or planned date of first trust
Jose Cabrera	160	Guadalajara	In use	PWR	July 1968.
Santa Maria de Garona	460	Burgos	do	BWR	March 1971.
Vandellos 1	500	Tarragona	do	GCR	May 1972.
Almaraz 1 and 2	2x930	Caceres	Under construction	PWR	1977–78.
Lemoniz 1 and 2	2x930	Vizcaya	do	PWR	1977–78.
Asco 1	930	Tarragona	do	PWR	1977.
Asco 2	930	do	do	PWR	1979.
Cofrentes	975	Valencia	do	BWR	1979.
Trillo 1 and 2	2x1,000	Guadalajara	Contracted	PWR	1982–86.
Sayago	1,000	Zamora	do	PWR	1980.
Valdecaballeros 1 and 2	2x1,000	Badajoz	do	BWR	1981–82.
Vandellos 2	1,000	Tarragona	do	PWR	1981.
Vandellos 3	1,000	do	Preliminary authorization granted.	PWR	1983.
Regodola	900	Lugo	Preliminary authorization applied for.	----	1982.
Santillan	900	Santander	do	----	1980.
P. Endata 1 and 2	2x1,000	Guipuzcoa	do	----	1982–83.
Vergara	1,000	Navarra	do	----	1986.
Oguella 1 and 2	2x1,000	Viscaya	do	----	1988–89.
C.N. de Aragon	2x1,000	Zaragoza	do	----	1982–86.
Cabo Cope	1,000	Murcia	do	----	1981.
Tarifa 1 and 2	2x1,000	Cadiz	do	----	1981–83.
Escatron 1 and 2	2x1,000	Zaragoza	do	----	1982–85.
Asperillo 1 and 2	2x1,000	Huelva	do	----	1990–92.
Ametlla de Mar 1 and 2	2x900	Tarragona	do	----	1981–85.
N. del Bajo Cinca	1,000	Huesca	do	----	1984.
N. del Paramo	1,000	Leon	do	----	1984.

The Mineral Industry of Sweden

By Joseph B. Huvos [1]

In 1975, Sweden was one of the world's major iron ore producers and exporters, and produced substantial amounts of hydroelectric energy and nonferrous metals. Virtually all of the country's fossil fuel needs and a significant proportion of its industrial minerals requirements were imported. The major mineral products of the country and approximate percentages of world totals were as follows: White arsenic, 31%; selenium, 5%; iron ore, 4%; lead, 2.1%; zinc, 2.1%; pyrite, 2%; feldspar, 1.1%; copper, 0.6%; and tungsten, 0.4%.

In 1975, Sweden's gross national product (GNP) was about $69 billion.[2] Mining and quarrying, including stone and clays, contributed only an estimated 1.9%, while employing about 1.7% of the industrial labor force of about 670,000.[3] Iron and steel and metals (exclusive of mining) contributed about 2.2%, and the chemical industry, 3.1%.

The international recession finally reached Sweden in 1975, and was still deepening at yearend. Ore production ran at a low level as a result of marketing difficulties.

There were a number of significant developments in Sweden's mineral industries in 1975. Plants commissioned in 1975 included additions to AB Nynas Petroleum's oil refinery and three nuclear powerplants, two of them operated by Statens Vattenfallsverk and one by Sydsvenska Kraft AB. Construction continued at several projects. Zinc-mining capacity was expanded at the mines of Société des Mines et Fonderies de Zinc de la Vieille Montagne (Vieille Montagne), a Belgian firm. North of the Arctic Circle, Luossavaara-Kirunavaara AB (LKAB) continued to modernize and expand its Kirunavaara iron mining facilities and its transshipment facilities at Narvik, Norway and at Luleå (Gulf of Bothnia). Boliden AB continued construction of a sulfur dioxide gas system at its Rönnskär smelter. Statsforetag AB continued construction of its petroleum refinery at Lysekill on the west coast.

Government measures in 1975 included the scaling-down of Stälwerk 80 (the proposed expansion of the State-owned steel company), enacting a new energy policy limiting Sweden's energy consumption, approving expansion plans of Boliden's Rönnskär smelter, and concluding a Swedish-Norwegian agreement to coordinate the two petroleum industries. These subjects are discussed more fully later in the chapter.

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[1] Physical scientist, International Data and Analysis.

[2] Values in Swedish kroner (SKr) were converted at the rate of SKr4.1522=US$1.00 for 1975. Source of conversion rate was the International Monetary Fund. Source of GNP was U.S. Embassy, Stockholm, Sweden, State Department Airgram A-52, Mar. 2, 1975, p. 2.

[3] Swedish Institute. The Swedish Mining Industry. FS 40, June 1975, pp. 1–2.

PRODUCTION

In 1975, production of most minerals and related products decreased owing to falling domestic and foreign demand. Production of selected mineral commodities in Sweden in 1973–75 is detailed in table 1.

Table 1.—Sweden: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975p
METALS			
Aluminum, unalloyed:			
Primary	81,399	82,008	76,789
Secondary	260	472	606
Arsenic:			
White, refined	15,200	13,300	10,500
Metallic	1,100	1,050	900
Bismuth, mine output, metal content e	15	15	15
Copper:			
Mine output, metal content	44,819	40,637	40,634
Metal, unrefined	2,420	--	807
Metal, refined:			
Primary	47,863	47,478	49,468
Secondary	11,628	12,430	6,753
Total	59,491	59,908	56,221
Gold:			
Mine output, metal content troy ounces	80,923	68,352	63,176
Metal including alloys do	122,141	118,990	109,923
Iron and steel:			
Iron ore and concentrate, gross weight:			
Direct shipping ore thousand tons	22,107	23,643	18,847
Concentrates do	12,620	12,509	12,020
Total do	34,727	36,152	30,867
Pig iron and sponge iron [2] do	2,759	3,176	3,484
Electric furnace ferroalloys do	226	214	205
Crude steel do	5,664	5,989	5,611
Steel semimanufactures:			
Bars, rods and sections do	1,588	1,621	1,494
Plates and sheets do	2,048	2,125	1,927
Strip do	142	164	115
Rails and accessories do	45	50	57
Pipe and tube stock do	229	266	253
Other, including forgings and castings do	200	247	280
Total do	4,252	4,473	4,126
Lead:			
Mine output, metal content	75,777	73,656	70,383
Metal (refined):			
Primary	46,632	45,185	38,342
Secondary and remelted	18,998	e 18,000	NA
Magnesium metal, secondary	9	e 10	e 10
Nickel metal, unalloyed	4,318	e 4,300	e 4,300
Selenium, elemental (refined)	62	e 50	e 40
Silicon metal	19,381	NA	NA
Silver:			
Mine output, metal content thousand troy ounces	4,739	4,545	4,515
Metal including alloys do	6,303	6,006	7,034
Tungsten, mine output, metal content	338	215	143
Uranium oxide (U_3O_8) e	70	70	70
Zinc:			
Mine output, metal content	118,542	113,699	111,325
Clinker (70% to 75% zinc)	28,200	26,900	25,200
NONMETALS			
Cement, hydraulic thousand tons	r 4,214	3,309	3,121
Chalk	33,816	44,135	33,945
Clays, refractory thousand tons	186	225	225
Diatomite, calcined	444	566	423
Feldspar, salable, crude and ground	27,955	31,964	44,742
Fertilizer materials, manufactured:			
Nitrogenous thousand tons	503	e 500	NA
Phosphatic:			
Thomas slag, gross weight do	143	148	137
Other do	430	NA	NA
Mixed and other do	886	NA	NA

See footnotes at end of table.

Table 1.—Sweden: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975[p]
NONMETALS—Continued			
Fluorspar	4,636	4,074	3,405
Lime (quicklime, hydrated lime, and deadburned dolomite) thousand tons	877	912	805
Pigments, natural mineral	1,578	1,083	1,440
Pyrite and pyrrhotite (including cupreous), gross weight thousand tons	450	425	414
Stone, sand and gravel:			
Dimension stone:			
Unworked:			
Limestone and marble do	45	38	36
Granite and gneiss do	83	72	64
Quartz do	44	47	41
Quartzite do	31	22	22
Micaceous schist do	20	19	18
Sandstone do	50	44	38
Other do	38	36	32
Worked, all types do	115	98	[3] 76
Crushed, broken and other:			
Clay slate do	81	81	68
Dolomite:			
Crude do	260	307	405
Burnt do	36	37	32
Granite and gneiss do	6,464	6,994	7,696
Limestone:			
For cement do	5,682	4,981	4,366
For lime do	1,221	1,221	1,050
For other industrial uses (including lime marl) do	1,571	1,771	2,053
Marble do	149	117	NA
Micaceous schist do	16	16	17
Quartz do	21	22	18
Quartzite do	1,861	1,902	1,932
Sandstone do	304	353	290
Other do	544	534	1,064
Sulfur:			
Content of pyrite do	232	218	211
Byproduct:			
From metallurgy do	139	[e] 140	[e] 140
From other sources do	8	[e] 10	[e] 10
Total do	379	[e] 368	[e] 361
Talc and steatite	28,029	28,404	23,846
Other nonmetals, crude [4]	36,359	13,394	NA
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	28,527	[e] 28,000	[e] 23,600
Coal, all grades [e] thousand tons	10	30	70
Coke, metallurgical do	533	481	820
Oil shale:			
For fuel production use do	126	101	88
For other use do	8	11	10
Peat:			
For agricultural use do	68	73	77
For fuel use do	28	36	34
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	11,209	9,592	12,989
Jet fuel do	956	950	1,013
Kerosine do	333	101	--
Distillate fuel oil do	24,594	24,933	26,700
Residual fuel oil do	30,010	29,148	33,664
Lubricants do	534	644	294
Other:			
Naphtha do	NA	1,988	491
White spirit do	NA	1,340	101
Unspecified do	2,334	566	3,868
Refinery fuel and losses do	3,812	5,501	2,850
Total do	73,782	74,663	81,970

[e] Estimate. [p] Preliminary. 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 available information is inadequate to make reliable estimates of output levels.

[2] Production of sponge iron is as follows in thousand tons: 1973–190; 1974–197; 1975–175.

[3] Figure represents material for sale, not produced.

[4] Includes strontium minerals, unspecified minerals, and fragments of ceramic materials. Previously listed incorrectly as strontium minerals only.

TRADE

In 1975, there was no major change in the country's general trade pattern. Sweden traded with about 170 countries, although the bulk of the trade was with the Scandinavian countries and West Europe.

The main mineral commodities exported included iron and steel, iron ore, and nonferrous metals.

In 1974, U.S. imports from Sweden were valued at about $860 million; U.S. exports to Sweden during the same period were about $900 million. Mineral commodities, including iron and steel, nonferrous metals, mineral fuels, ores, and crude nonmetallic minerals accounted for about 8.5% of U.S. imports from Sweden and 6% of U.S. exports to Sweden.

Trade statistics for mineral commodities in 1973 and 1974 are shown in tables 2 and 3.

Table 2.—Sweden:—Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Alumina	20	5	NA.
Metal including alloys:			
Scrap	2,164	1,796	West Germany 1,188; Netherlands 416.
Unwrought	20,322	11,765	Norway 9,220.
Semimanufactures	r 43,003	50,674	Finland 10,942; Denmark 10,248; Norway 7,667.
Arsenic, oxides and acids value, thousands	$1,594	$11,846	NA.
Chromium, ore and concentrate	66	80	Norway 79.
Cobalt oxide	(1)	(1)	NA.
Copper:			
Ore and concentrate	36,687	33,855	Bulgaria 14,580; East Germany 8,435; Finland 6,463.
Matte	--	220	All to West Germany.
Metal including alloys:			
Scrap	423	353	West Germany 266.
Unwrought	19,011	20,632	United Kingdom 8,105; West Germany 4,690; France 3,093.
Semimanufactures	r 54,107	53,015	Norway 13,748; Denmark 9,704; United States 6,807.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	32,917	33,105	West Germany 10,013; Belgium-Luxembourg 9,086; United Kingdom 4,171.
Roasted pyrite do	379	418	United Kingdom 284; West Germany 134.
Metal:			
Scrap do	12	11	West Germany 6; Denmark 2.
Pig iron [2] do	r 138	313	Italy 60; Finland 45; People's Republic of China 40.
Ferroalloys do	84	85	United States 33; United Kingdom 22.
Steel, primary forms do	r 89	189	West Germany 79; Poland 34; Denmark 25.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	591	591	United Kingdom 92; Finland 75; Denmark 60.
Universals, plates, sheets do	819	792	West Germany 125; Denmark 117; France 108.
Hoop and strip do	87	92	Denmark 12; United States 9; Norway 8; Finland 8.
Rails and accessories do	18	26	Norway 8; West Germany 6; East Germany 6.
Wire do	74	82	United States 15; West Germany 7; France 6.
Tubes, pipes, fittings do	231	242	West Germany 27; United Kingdom 24; France 21; Finland 20.
Castings and forgings, rough do	3	3	Finland 1; Denmark 1.

See footnotes at end of table.

Table 2.—Sweden: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Lead:			
Ore and concentrate	57,129	46,690	West Germany 30,643; Belgium-Luxembourg 11,068; Netherlands 4,979.
Oxides	960	577	NA.
Metal including alloys, all forms	30,930	29,396	West Germany 18,078; Denmark 4,580; Finland 3,629.
Magnesium metal including alloys:			
Scrap	174	214	West Germany 104; United States 83.
Unwrought and semimanufactures	33	15	Finland 6; Netherlands 5.
Mercury	290	203	Colombia 116; Denmark 58; Norway 29.
Molybdenum ore and concentrate	634	416	United Kingdom 222; Finland 122; Spain 40.
Nickel:			
Ore and concentrate	20	--	
Metal including alloys:			
Scrap	1,223	622	West Germany 393; United Kingdom 109.
Unwrought	2,827	2,507	Netherlands 2,341.
Semimanufactures	1,533	2,287	Romania 335; Poland 241; Brazil 167; United Kingdom 163.
Platinum-group metals and silver:			
Waste and sweepings value, thousands	r $5,387	$8,980	West Germany $5,326; United Kingdom $1,640.
Metal including alloys, unworked or partly worked:			
Platinum group do	$617	$1,064	Finland $546; West Germany $324.
Silver thousand troy ounces	5,433	4,501	NA.
Silicon, elemental	16,905	14,655	East Germany 2,760; West Germany 2,493; United Kingdom 2,406; Japan 1,477.
Tin metal including alloys:			
Scrap	48	14	Norway 6; Italy 6.
Unwrought and semimanufactures	r 82	90	Denmark 48; Norway 23; Finland 15.
Titanium:			
Ore and concentrate	--	72	Chile 30; Turkey 24.
Oxides	210	242	West Germany 138; Denmark 33.
Tungsten:			
Ore and concentrate	134	33	West Germany 22; Netherlands 9.
Metal	118	99	Netherlands 28; United States 14; West Germany 13.
Zinc:			
Ore and concentrate	224,595	231,066	West Germany 76,981; Belgium-Luxembourg 69,236; Norway 34,763.
Oxide and peroxide	660	477	Norway 167; United Kingdom 149.
Metal including alloys:			
Powder	24	84	Norway 34; Denmark 28; Netherlands 15.
Scrap	2,118	1,103	Norway 566; Belgium-Luxembourg 261; West Germany 118.
Unwrought and semimanufactures	3,427	2,044	Netherlands 1,300; Norway 224.
Zirconium ore and concentrate	17	62	Norway 40.
Other:			
Ores and concentrates	13	--	
Ash and residues containing nonferrous metals	35,896	32,526	Norway 27,402.
Oxides, hydroxides, peroxides of metals, n.e.s	21	59	Austria 46.
Base metals including alloys all forms	r 572	913	Poland 273; Finland 143; United Kingdom 110.
Unspecified	--	7	Colombia 4; Denmark 2; Norway 1.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc value, thousands	$5	$6	Netherlands $3.
Dust and powder of precious and semiprecious stones do	$30	$4	Norway $3.
Grinding and polishing wheels and stones	2,393	2,558	West Germany 519; Finland 380.

See footnotes at end of table.

Table 2.—Sweden: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Asbestos	57	60	Finland 16; Morocco 15; Poland 14.
Borates, crude	6	122	Denmark 104.
Cement, hydraulic	r 795,973	473,405	NA.
Chalk	7,715	9,383	Denmark 2,626; Norway 2,606; Finland 1,220.
Clays and clay products (including all refractory brick):			
Crude clays	637	1,201	Norway 673; Denmark 205; Finland 132.
Products:			
Refractory (including nonclay bricks)	36,240	37,789	Norway 11,498; Finland 10,607; Denmark 6,548.
Nonrefractory	53,078	40,913	Norway 12,111; Denmark 6,736; Finland 5,283.
Diamond:			
Gem, not set or strung value, thousands	$6,785	$3,923	Belgium-Luxembourg $3,291.
Industrial do	$16	$93	United Kingdom $61; West Germany $21.
Diatomite (including other infusorial earth)	182	216	Finland 84; Norway 39.
Feldspar, fluorspar, etc	23,157	39,412	United Kingdom 15,678; East Germany 7,650; West Germany 6,747.
Fertilizer materials:			
Crude phosphatic	4,822	22,200	Finland 14,621; Norway 6,684.
Manufactured:			
Nitrogenous	r 68,115	88,521	Denmark 8,178; East Germany 5,050.
Phosphatic	80,622	173,041	NA.
Potassic	6,357	--	
Other, including mixed	25,505	19,598	Norway 9,156.
Graphite, natural	82	246	West Germany 187; France 37.
Gypsum and plasters	1	1,224	Ghana 1,214.
Lime	1,892	2,236	Finland 1,348; Norway 851.
Magnesite	163	1,060	Norway 1,006.
Mica, including splitting and waste	6	5	NA.
Pigments mineral:			
Crude	38	20	Sri Lanka 7.
Iron oxide	23	101	Finland 28; Taiwan 25; United Kingdom 23.
Salt and brines	1,930	730	Norway 672.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Granite gneiss, sandstone, etc	602,698	325,581	Netherlands 213,310; Denmark 35,503.
Marble and other calcareous	2,934	2,670	Denmark 2,103.
Slate	14,316	10,570	Norway 3,970; Belgium-Luxembourg 3,743; Denmark 1,045.
Worked	15,213	15,273	Denmark 12,467.
Dolomite, chiefly refractory grade	2,523	4,628	Norway 1,640; Finland 1,524.
Gravel and crushed stone thousand tons	1,176	1,382	West Germany 674; Denmark 511; Finland 103.
Limestone	729,844	858,204	Finland 441,297; West Germany 292,056; Denmark 122,252.
Quartz and quartzite	56,521	124,847	Norway 73,075; West Germany 22,437.
Sand, excluding metal bearing	50,194	62,894	Norway 46,874; Denmark 7,447.
Sulfur:			
Elemental, all forms	1	--	
Sulfuric acid	264,929	73,075	Canada 29,598; United States 28,212; Norway 8,325.
Sulfur dioxide	4,519	9,952	Norway 9,173.
Talc, steatite, soapstone, pyrophyllite	2,554	3,590	United Kingdom 2,611; Netherlands 366.
Other nonmetals, n.e.s.:			
Crude	40,981	19,603	United Kingdom 12,245; Denmark 3,787; Norway 2,920.
Slag, dross and similar waste, not metal bearing	55,501	150,815	East Germany 54,921; Norway 29,441; Finland 24,442.
Oxides, hydroxides of magnesium, strontium, barium	51	65	Norway 25; Denmark 19; United Kingdom 10.

Table 2.—Sweden: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	12	36	Poland 21.
Carbon black	7,012	6,069	Norway 2,673; Finland 2,576; Denmark 761.
Coal and coke, including briquets	24,427	83,056	West Germany 25,833; United Kingdom 24,113; Netherlands 18,333.
Hydrogen, nitrogen and rare gases	2,817	3,151	Denmark 2,559.
Peat, including briquets and litter	19,154	18,349	Denmark 10,648; Norway 5,300.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	551	708	Denmark 411; Norway 268.
Jet fuel do	r 31	226	Denmark 175; Norway 50.
Kerosine do	93	72	Norway 60.
Distillate fuel oil do	3,362	1,747	Denmark 908; Norway 763.
Residual fuel oil do	3,280	2,506	Denmark 2,077.
Lubricants do	r 538	552	Norway 135; Finland 128; Denmark 75.
Other:			
LPG do	259	249	Denmark 159; Norway 90.
Unspecified do	r 2,188	3,500	United Kingdom 1,831; Denmark 721.
Total do	r 10,302	9,560	
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	r 23,488	9,069	Netherlands 2,819; Spain 1,316; Belgium-Luxembourg 1,055.

r Revised. NA Not available.
[1] Less than ½ unit.
[2] Includes shot, grit, spiegeleisen, etc. of iron and steel.

Table 3.—Sweden: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	48,772	97,121	Australia 47,790; Greece 33,934.
Alumina	188,020	188,165	Jamaica 108,563; West Germany 36,452; Surinam 23,319.
Metal including alloys:			
Scrap	4,160	1,947	Romania 695; Norway 618; United Kingdom 201.
Unwrought	42,317	54,360	Norway 30,477; Ghana 9,525.
Semimanufactures	41,757	50,071	Norway 10,273; West Germany 6,881; Belgium-Luxembourg 4,489.
Chromium:			
Chromite	r 247,349	270,287	U.S.S.R. 158,621; Turkey 71,912; Albania 21,803.
Oxide and hydroxide	2,805	2,594	West Germany 1,122; U.S.S.R. 970.
Cobalt oxide and hydroxide	5	5	Belgium-Luxembourg 4; United Kingdom 1.
Copper:			
Ore and concentrate	44,902	40,360	Ireland 18,411; Norway 15,343; Canada 5,405.
Matte	10,589	3,118	All from France.
Metal including alloys:			
Scrap	6,155	5,036	United States 2,225; France 1,240; Netherlands 751.
Unwrought	r 62,560	70,399	Chile 15,854; Belgium-Luxembourg 15,176; U.S.S.R. 9,024.
Semimanufactures	26,273	27,182	United Kingdom 8,631; West Germany 5,036; Finland 4,272.
Iron and steel:			
Ore and concentrate, except roasted pyrite	(1)	82,000	All from Liberia.

See footnotes at end of table.

Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Iron and steel—Continued			
Metal:			
Scrap	278,333	368,234	U.S.S.R. 165,067; Poland 80,607; Denmark 52,121.
Pig iron, including cast iron	r 343,732	216,013	West Germany 85,475; Finland 70,090; U.S.S.R. 21,843.
Ferroalloys	203,837	214,596	Norway 90,268; Greece 31,051.
Steel, primary forms	172,896	141,030	Finland 120,506; West Germany 12,187.
Semimanufactures:			
Bars, rods, angles, shapes, sections	r 505,593	576,079	West Germany 148,534; Belgium-Luxembourg 128,907.
Universals, plates, sheets	r 1,040,677	1,098,594	West Germany 234,300; Belgium-Luxembourg 185,360.
Hoop and strip	120,386	129,059	West Germany 45,738; Poland 16,896.
Rails and accessories	5,211	3,339	West Germany 1,806; United Kingdom 801; Belgium-Luxembourg 413.
Wire	22,266	27,981	United Kingdom 6,511; West Germany 5,358; Belgium-Luxembourg 5,241.
Tubes, pipes, fittings	r 277,709	314,681	West Germany 114,725; United Kingdom 50,987; Finland 30,775.
Castings and forgings, rough	9,919	13,045	Poland 4,708; Norway 1,633; Finland 1,468.
Total	r 1,981,761	2,162,778	
Lead:			
Oxides	1,521	1,585	United Kingdom 1,131; West Germany 299.
Metal including alloys:			
Unwrought	4,144	8,446	United Kingdom 2,893; Denmark 2,407; West Germany 1,247.
Semimanufactures	1,827	1,303	West Germany 757; Belgium-Luxembourg 237; Norway 192.
Magnesium metal including alloys:			
Unwrought, including scrap	1,054	1,785	Norway 1,497; United States 255.
Semimanufactures	173	237	Norway 145; France 42.
Manganese:			
Ore and concentrate	60,391	37,870	U.S.S.R. 34,797.
Oxides	2,276	1,970	People's Republic of China 1,422; West Germany 303.
Mercury ____76-pound flasks	2,205	2,118	Spain 1,595; U.S.S.R. 261.
Molybdenum:			
Ore and concentrate	8,237	8,456	United States 3,572; Netherlands 3,438.
Metal including alloys, all forms	65	71	Austria 16; United States 15; West Germany 12.
Nickel:			
Matte	3,789	1,852	Canada 945; Netherlands 452; U.S.S.R. 327.
Metal including alloys:			
Scrap	472	1,056	United States 711; United Kingdom 186.
Unwrought	12,069	13,746	United Kingdom 4,274; Norway 3,525.
Semimanufactures	5,357	6,160	Netherlands 4,958; United Kingdom 528.
Platinum-group metals and silver:			
Ore and concentrate	1,099	123	All from Colombia.
Waste and sweepings	262	366	West Germany 91.
Metal including alloys, unwrought or partly worked:			
Platinum group ____value, thousands	$3,338	$7,417	United Kingdom $3,069; West Germany $2,792.
Silver ____do	$8,822	$21,536	West Germany $8,611; United Kingdom $7,075.
Tantalum ____do	$64	$162	United States $101; West Germany $49.
Tin:			
Oxide	65	41	United Kingdom 22; West Germany 19.
Metal including alloys:			
Unwrought, including scrap	495	641	United Kingdom 311; Malaysia 122; West Germany 74.
Semimanufactures	183	255	United Kingdom 160; West Germany 51.

See footnotes at end of table.

Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Titanium:			
Ore and concentrate	3,754	4,797	Australia 4,290; India 404.
Oxide	5,062	6,173	Finland 2,869; West Germany 670; Czechoslovakia 566.
Tungsten:			
Ore and concentrate	2,442	1,909	People's Republic of China 636; Thailand 504; Brazil 460.
Metal including alloys, all forms	200	34	West Germany 17; France 7.
Zinc:			
Oxide	1,969	2,086	Netherlands 960; Norway 325; Czechoslovakia 275.
Metal including alloys:			
Blue powder	175	663	Norway 628.
Scrap	43	444	Norway 187; Finland 146; West Germany 95.
Unwrought	45,496	44,625	Norway 23,915; Finland 12,996.
Semimanufactures	1,531	1,368	West Germany 609; Norway 246.
Other:			
Ores and concentrates, n.e.s	1,562	720	Australia 608; United States 107.
Ash and residues containing nonferrous metals, n.e.s	64,232	39,533	West Germany 13,920; United Kingdom 7,814; Poland 6,272.
Oxides, hydroxides, peroxides of metals, n.e.s	2,164	2,252	Finland 670; West Germany 504; Netherlands 291.
Metals including alloys, all forms	r 6,167	7,253	Republic of South Africa 2,154; France 1,329; U.S.S.R. 831.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	899	1,458	Iceland 1,072.
Dust and powder of precious and semiprecious stones value, thousands	$1,067	$793	United Kingdom $277; United States $228.
Grinding and polishing wheels and stones	3,078	3,862	United Kingdom 1,329; Austria 1,084; West Germany 505.
Asbestos	18,679	17,399	Canada 7,666; U.S.S.R. 6,186; Cyprus 1,588.
Barite and witherite	3,568	4,451	West Germany 3,926; France 362.
Boron:			
Crude natural borates	17,149	18,903	United States 9,719; Turkey 8,009.
Oxide and acid	803	790	Turkey 295; France 231; United States 203.
Cement	r 26,434	23,637	Denmark 17,889; United Kingdom 2,050.
Chalk	21,963	18,264	Denmark 7,389; West Germany 6,293; France 2,683.
Clays and clay products, including all refractory brick:			
Crude clays, n.e.s	r 297,263	313,656	United Kingdom 263,163; Czechoslovakia 19,381.
Products:			
Nonrefractory	40,713	28,196	West Germany 5,488; Poland 5,029; Denmark 4,946.
Refractory, including nonclay brick	141,536	168,946	Austria 50,258; United Kingdom 44,949; West Germany 33,923.
Cryolite and chiolite	831	1,540	All from Denmark.
Diamond:			
Gem, not set or strung value, thousands	$8,338	$11,655	Belgium-Luxembourg $6,109; U.S.S.R. $3,211.
Industrial do	$1,183	$1,605	Republic of South Africa $609; United Kingdom $516.
Diatomite and other infusorial earth	4,743	4,808	United States 1,931; Denmark 1,369; Iceland 655.
Fertilizer materials:			
Crude:			
Nitrogenous	21,656	27,250	Chile 27,230.
Phosphatic	626,985	695,900	Morocco 431,778; U.S.S.R. 185,694; United States 65,415.
Manufactured:			
Nitrogenous	485,497	516,738	Norway 399,619; United States 50,856.

See footnote at end of table.

Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured—Continued			
Phosphatic	17,440	26	NA.
Potassic	1,387	922	West Germany 910.
Other	127,841	93,304	Norway 69,162.
Ammonia	108,915	119,287	Norway 95,505; East Germany 20,157.
Fluorspar, feldspar, leucite, etc	21,743	19,320	People's Republic of China 8,233; Finland 2,751; France 2,401.
Graphite, natural	1,284	1,271	West Germany 356; People's Republic of China 325; Austria 277.
Gypsum and plasters	470,954	427,934	Poland 165,643; U.S.S.R. 110,079; Spain 100,920.
Lime	10,857	6,411	Denmark 5,023; Finland 622.
Magnesite	6,249	7,062	U.S.S.R. 3,736; Austria 1,181; United Kingdom 825.
Mica, all forms	1,217	1,004	Norway 427; United Kingdom 141; West Germany 97.
Pigments, mineral:			
Natural, crude	97	91	France 43; Austria 21; West Germany 13.
Iron oxides, processed	7,863	8,654	West Germany 7,673; United Kingdom 488.
Precious and semiprecious stones, except diamond ... value, thousands	$630	$624	Switzerland $196; West Germany $181; Austria $162.
Pyrite, unroasted	70,496	101,472	Norway 101,239.
Salt ... thousand tons	1,074	1,204	Netherlands 553; West Germany 287; United Kingdom 157.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	44,143	58,096	Belgium-Luxembourg 52,516.
Caustic potash	2,769	2,966	France 1,636; West Germany 1,275.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Marble and other calcareous stone	964	1,499	Norway 535; Italy 519; Belgium-Luxembourg 274.
Slate	2,499	2,420	Norway 1,956; Finland 315.
Other, including granite, gneiss, etc	5,764	2,840	Norway 1,643; Finland 829; Republic of South Africa 326.
Worked, all types	12,209	10,636	Portugal 6,800; Italy 1,461.
Dolomite	23,061	25,970	Norway 20,652; Finland 4,338.
Gravel and crushed stone	56,328	49,635	Denmark 23,982; Finland 8,917.
Limestone (except dimension)	117,359	135,595	United Kingdom 76,858; Denmark 53,014.
Quartz and quartzite	32,978	42,834	Spain 42,012.
Sand, excluding metal bearing	337,258	585,024	Denmark 472,858; Belgium-Luxembourg 92,754.
Sulfur:			
Elemental, all forms	100,712	129,816	Poland 81,344; United States 19,202; Finland 19,058.
Sulfuric acid, including oleum	112,499	100,166	Poland 57,035; Finland 28,003; Norway 13,473.
Sulfur dioxide	3,997	9,001	West Germany 8,424.
Talc, steatite, soapstone, pyrophyllite	22,923	24,729	Norway 12,722; Austria 4,806; Belgium-Luxembourg 2,699.
Other nonmetals, n.e.s.:			
Crude	80,402	108,787	Norway 57,566; West Germany 33,195; Denmark 12,025.
Slag, dross, and similar waste, nonmetal bearing	4,112	419	West Germany 230; United Kingdom 115.
Oxides and hydroxides of magnesium, strontium, barium	20,339	19,288	Norway 10,129; United Kingdom 3,229; Greece 3,150.
Bromine, iodine, fluorine	11	24	Chile 8; Japan 6; Israel 6.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	886	883	United States 451; Trinidad and Tobago 418.
Carbon back	10,097	10,153	West Germany 5,497; Netherlands 1,994; United Kingdom 1,791.

See footnote at end of table.

Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coal and briquets:			
Anthracite and bituminous coal thousand tons	1,027	1,501	Poland 743; U.S.S.R. 470; United States 166.
Lignite and lignite briquets	9,836	12,763	Yugoslavia 6,111; East Germany 3,470; West Germany 1,638.
Coke and semicoke thousand tons	1,495	1,599	West Germany 865; United Kingdom 320; U.S.S.R. 172.
Hydrogen, helium, rare gases	862	1,291	West Germany 622; Denmark 294; Netherlands 268.
Peat and peat briquets	603	650	Finland 647.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	r 78,163	74,158	Nigeria 18,088; Iran 10,569; Venezuela 6,872.
Refinery products:			
Gasoline do	r 18,885	18,319	Denmark 4,012; United Kingdom 3,101; Belgium-Luxembourg 3,094.
Jet fuel do	1,406	1,133	United Kingdom 562; Netherlands 249; Belgium-Luxembourg 199.
Kerosine do	1,712	1,052	United Kingdom 376; Belgium-Luxembourg 236; U.S.S.R. 192.
Distillate fuel oil do	51,667	46,589	United Kingdom 11,416; Belgium-Luxembourg 7,898; U.S.S.R. 5,381.
Residual fuel oil do	r 57,344	58,096	U.S.S.R. 16,974; United Kingdom 9,233; Belgium-Luxembourg 5,499.
Lubricants do	1,114	1,299	Netherlands 355; United Kingdom 354; West Germany 266.
Other:			
LPG do	257	1,067	Netherlands 558; United Kingdom 253.
Naphtha do	r 8,597	9,595	Saudi Arabia 5,068; Norway 1,540.
Mineral jelly and wax do	141	177	West Germany 85; United Kingdom 23; East Germany 23.
Petroleum coke, asphalt, and bitumen do	995	1,263	United States 568; Denmark 412; West Germany 261.
Unspecified do	332	784	U.S.S.R. 258; Saudi Arabia 202.
Total do	r 142,450	139,374	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 60,228	55,643	United Kingdom 11,139; Belgium-Luxembourg 10,527; Netherlands 9,918.

r Revised. NA Not available.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—The decline in demand for aluminum products, which began at yearend 1974 and affected mainly semimanufactures, grew still more pronounced in 1975. The only Swedish producer of primary metal, Gränges Aluminium AB, owned 79% by Gränges AB and 21% by Alcan Aluminium Ltd., operated its 85,000-ton-per-year reduction plant at 91% of capacity. The plant is located at Sundsvall on the east coast. To maintain employment, which was about 3,380 persons in 1975, there was a heavy buildup in stocks.[4] Gränges also operated a secondary smelter at Mansbo, about 100 kilometers northwest of Stockholm.

Original plans to expand the Sundsvall reduction plant to 110,000 tons per year in 1977 and 135,000 tons per year in 1978 were shelved because the Government declined to help with financing of the project. In the meantime, the company's available resources were to be rechanneled, mainly into the enlargement of the finished goods manufacturing sector. Potential increases

[4] Gränges A.B. 1975, Annual Report. Pp. 15–16.

in future demand for metal were to be met by purchases on the international market.

Copper, Lead, and Zinc.—There were a number of important events in 1975 in the copper, lead, and zinc industry.

The Swedish Government approved the $150 million expansion of Boliden's Rönnskär smelter located near Skellefteå, on the Gulf of Bothnia. The plan called for copper production capacity to be increased from 60,000 to 85,000 tons per year. Lead capacity was to be raised from 45,000 to 70,000 tons per year; sulfur dioxide capacity, from 30,000 to 70,000 tons per year; and arsenic metal capacity, from 1,300 to 1,600 tons per year. About $40 million of the cost was to be spent on pollution control equipment. This plan represented the first of a two-stage expansion. Final plans for the second stage of the project, to be prepared by 1978, were to include an increase in copper production capacity to 100,000 tons per year.[5]

In 1975, Boliden continued to account for most of the copper and lead produced in Sweden. Stora Kopparbergs Bergslags AB (SKB) produced the rest at its Falun and Tomtebo mines in central Sweden.

Boliden operated about 22 mines, most of them for complex sulfide ores containing copper, lead, zinc, arsenic, gold, and silver. The company's six concentrating plants were located strategically near Boliden's principal mining centers. Sweden's largest copper mine, Aitik, was situated in the Kiruna-Malmberget area. Fourteen mines were in the Skellefteå District, which extends from Boliden in the east to the highlands in the west and along the Norwegian border. The largest of these was at Laisvall, said to be the greatest single source of lead ore in Europe. Seven mines, owned by Boliden, were operated in the Bergslagen mining district in central Sweden. Sweden's proven reserves of sulfide ores amounted to about 250 million tons.[6]

Continued expansion of Boliden's Aitik mine in 1975 was estimated to have raised the mine's capacity to 25,000 tons per year of copper contained in ore.[7]

Boliden planned to start mining the Stekenjokk deposits in 1976. The deposits are located about 65 kilometers north of Gäddede on the Norwegian border and were leased from the Swedish Government. Plans called for mining 400,000 tons per year of ore averaging 1.6% copper and 3.3% zinc.

In an attempt to locate new copper sources to supply the expansion of its smelter, Boliden launched an exploration program on Catanduanes Island in the Philippines in partnership with Swedish Match Co.[8]

Work continued on expanding production capacity at the mines of Vieille Montagne from 300,000 to 600,000 tons per year of zinc ore; the project started in about 1973 and was to be completed in 1976. Thus, Sweden's largest zinc producer and the only foreign-owned mining operation in Sweden, was on the way to becoming the largest zinc producer on the European continent.

Vieille Montagne had mining operations in the Zinkgruvan area, about 15 kilometers north of Motala on the eastern shore of Lake Vättern and centered around the Nygruvan and Knallagruvan mines. There the firm mined zinc-lead ores grading 8% zinc, 1.2% lead, and 35 grams per ton of silver. There was no zinc smelter in Sweden, and domestic zinc concentrates had to be exported for processing.

Iron and Steel.—Stählverk 80 is the proposed expansion of Sweden's State-owned steel company, Norbottens Järnverk A/S (NJA), located at Luleå on the northeast coast. According to the original plans, the project was to produce 4 million tons of blooms, slabs, and billets; new plans call for a trimmed down capacity of 2.5 million tons. The reduced project was estimated to cost about $2 billion compared with $3 billion for the earlier plan. NJA was to build, jointly with SKB, a 1.5-million-ton-per-year rolling mill at Gävle, 15 kilometers north of Stockholm.[9]

Although pig iron production in 1975 was sustained at a high level, the production of crude steel declined even though it had been rising almost continuously during the last decade. The decline in Sweden's steel production in 1975 was blamed mainly on the economic recession prevailing in market economy countries. De-

[5] Engineering and Mining Journal. Swedes Approve Expansion of Boliden Smelter. August 1975, p. 36.
[6] Work cited in footnote 3.
[7] International Wrought Copper Council (London). Survey of Planned Increases in World Copper Capacities. November 1975, p. 37.
[8] Engineering and Mining Journal. June 1975.
[9] U.S. Embassy, Stockholm, Sweden. State Department Airgram A-147, June 29, 1976, p. 4.

pressed steel prices, both in Sweden and abroad, plus sharply rising mill operating costs, notably for labor and fuel, cut deeply into the profits of most Swedish steel companies. NJA was hit particularly hard by the downturn in Sweden's construction and shipbuilding industries. The company lost $27.5 million in calendar year 1975.[10]

Special steels, including alloys and high carbon steels, comprised nearly one-third of Sweden's total steel production. About 20 mills could be classified mainly as special-steel producers, although they often turned out a quantity of ordinary steel. The largest special steel manufacturers in Sweden were Avesta Järnverks AB, Fagersta AB, Sandvik AB, and Uddeholm AB. Other leading producers were Hofors and Hellefors (which belong to the SKF Steel Div.), and Söderforswikmanshyttan (belonging to SKB).

Ordinary steel including nonalloyed steel of low carbon content was produced at about 10 Swedish mills. The mills were relatively small compared with steelworks in other countries, and only three of them had an annual crude steel production in the 1-million-ton range. The largest was the Domnarvet Works near Borlänge (owned by SKB), producing about 1.2 million tons of steel per year. This was processed into sheet, plate, bars, sections, wire rod, and strip. Next in size was Gränges Steel's Oxelösund Steelworks, turning out 1 million tons per year of steel that was used entirely to roll plate for shipbuilding and industrial use.

NJA, located at Luleå at the far northern end of the Gulf of Bothnia, produced about 0.8 million tons per year of crude steel, which was used to produce sheet metal. Many steelworks in central Sweden extracted high-quality, low-phosphorus iron ore from their own mines, often located close to the mills, and had complete facilities to produce finished products. Examples of such vertical integration included Gränges, Sandvik, and SKF. All Swedish steelmakers were coowners of the Swedish Ironmasters' Association (Jernkontoret). One of the main tasks of Jernkontoret was to administer the joint research program of the Swedish steel industry.[11] Jernkontoret represented the steel industry in all matters of common interest except labor relations, which were handled by a separate organization called the Swedish Iron and Steel Workers' Association (Järnbruksförbundet).

Iron Ore.—In 1975, LKAB continued planning and construction work at its mines. Development continued at the new 775-meter haulage level in Kirunavaara, including laying out the rail haulage and trackless services. A decision was made to modernize the Kirunavaara pelletizing plant. Plans were prepared to raise capacity of the Svappavaara concentrator and pelletizing plant from 2.2 million to 3 million tons per year. At Malmberget, a complete hematite concentrate drying plant was installed to prevent freezing of the concentrate when it is unloaded in winter.

LKAB also continued work on modernizing ore transshipment facilities at Narvik in Norway and planning expanded facilities to supply ore to Stålverk 80 at Luleå.

Sweden's iron ore production and export shipments dropped steeply during 1975 as a result of the economic recession in Western Europe and the low rate of capacity utilization of its iron and steel industry. The decline in iron ore production would have been even steeper had it not been for the fact that most mines built up ore inventories as a means of sustaining employment. By the end of 1975, these inventories had reached a high of 9.7 million tons.[12] Thus mine production ran at about 85% of capacity and deliveries at about 70%. However, even at the lower rate, Sweden remained one of the world's major producers of iron ore, with almost 4% of world output.

Sweden exported the major share of its iron ore production. In 1975, about one-half of exports was direct-smelting lump ore; the remainder was concentrate, powder, pellets, and sinter. Major recipients of iron ore exports in 1975 remained the West European countries, led by the Federal Republic of Germany, Belgium-Luxembourg, and the United Kingdom, and Poland in East Europe.

Sweden's iron mining industry was controlled mainly by four companies operating 13 major and 10 smaller mines. The largest among them was State-controlled LKAB, employing about 8,000 persons in iron-ore-related operations. LKAB ac-

[10] U.S. Embassy, Stockholm, Sweden. State Department Airgram A-147, June 29, 1976, p. 3.
[11] Swedish Institute. The Swedish Steel Industry. FS 17 JP, January 1976.
[12] Swedish Mineowners Association (Stockholm). As reported by U.S. Embassy, Stockholm. State Department Airgram A-39, Feb. 20, 1976, p. 1.

counted for about 83% of Swedish output with five mines, all located north of the Arctic Circle in Swedish Lapland. Three among these, the Kirunavaara, Malmberget, and Tuollavaara mines, were underground operations; the others were the open pit mines of Svappavaara and Kirunavaara. Of the remaining mines, all situated in central Sweden, Gränges AB operated those at Grängesberg and Strassa; Stora AB operated Dannemora, Risbergsfältet, Håksberg, Blotberget, and Vintjärn; Ställberg AB operated four smaller mines; and there were six independent mines of minor importance.

Proven iron ore reserves in the Kiruna-Malmberget District were estimated at about 3 billion tons. In central Sweden's mining district, known as Bergslagen, iron ore reserves were about 975 million tons in 1975.[13]

Tungsten.—Production of tungsten concentrate declined in 1975 at the country's only tungsten mine at Yxsjöberg in the Berglagen area of central Sweden. The mine was operated by AB Stätsgruvor, a subsidiary of LKAB.

Uranium.—At the beginning of 1975, LKAB assumed responsibility, together with AB Atomenergi and the Swedish State Power Board, for conducting further studies on the extraction of uranium from alum shales in the Billingen shale at Ranstad, southeast of Lake Vänern near Skara in central Sweden. If the necessary permits are secured in 1976, uranium production would start in 1981. Production from 6 million tons of shale was to amount to 1,275 tons per year of U_3O_8. Planning was to cost about $10 million and was subject to a government loan.

NONMETALS

Cement and Other Building Materials.—In 1975, Cementa AB remained Sweden's only cement producer, with its six plants around the country having a total installed capacity of about 4.2 million tons.[14] The three largest plants—Gullhoegan (north of Jönköping), Linhamn (near Malmö), and Slite (on Gotland Island)—had a capacity of 1 million tons per year each. Smaller plants were located at St. Vika, near Stockholm (500,000 tons per year) and Degerhamn on Äland Island (300,000 tons per year). Cementa's Köping plant was recently converted from cement to lime.

Ahsell and Ågren AB was Sweden's leading producer of industrial sand, mainly on the Danish island of Bornholm, and at Baskarp near Jönköping, as well as from dredging off the Swedish coast near Malmö and from a sandstone deposit at Motala.

AB Forshammars Bergverk exploited a quartzite deposit southwest of Lake Vänern in the Dalsland area of central Sweden. Mines were at Vingenäs (65,000 tons per year) and at Annebyn (10,000 tons per year). Svenska Silikaverken was the other main producer of silica, also in the Dalsland area.

Limestone and dolomite were produced by numerous firms, the main ones being Ytong AB, Strabruken AB, and Cementa. Enström Mineral AB mined underground a white crystalline dolomite marble at Glanshammar near Örebro in central Sweden, and also in the Ostergötland District.

Kritbruksbolaget i Malmö AB, Sweden's sole chalk producer, mined white chalk at the Kvarnby pit near Malmö.

Feldspar.—In 1975, AB Forshammars Bergverk, a subsidiary of LKAB, was Sweden's only feldspar producer. The Limberget quarry in Örebro County, about 40 kilometers north of Köping, was based on a white pegmatite consisting mainly of albite, microline, quartz, and muscovite. Proven reserves were estimated at 4 million tons with evidence of additional tonnages. Current capacity of the mine and processing plant was about 55,000 tons per year.[15]

Fertilizer Materials.—With the exception of nitrogenous fertilizers, almost all raw materials for the production of manufactured fertilizers had to be imported. LKAB continued studying the possibility of utilizing the apatite ore associated with the iron ore mined at the company's Kiruna and Malmberget mines in the north of the country.

Boliden produced dicalcium phosphate using its sulfuric acid at its Reymersholme works near Stockholm. At Hälsingborg and at Landskrona in the south, it produced phosphoric acid. All production was from imported phosphate rock.

Sweden produced domestically about one-half of its nitrogenous fertilizer requirements. Four ammonia plants had an annual total capacity of 109,000 tons of nitrogen.

[13] Work cited in footnote 3.
[14] Industrial Minerals. December 1974, p. 26.
[15] Industrial Minerals. Sweden: Real Potential Yet to be Realized. January 1976, p. 17.

Electrokemiska AB operated a 3,000-ton-per-year plant at Bohun on the west coast; Svenska Salpeterverken AB operated a 49,000-ton-per-year plant at Köping and a 54,000-ton-per-year plant at Kvantorp, both in central Sweden; and Uddeholms AB operated a 3,000-ton-per-year plant at Skoghall near Lake Vänern.[16]

Fluorspar.—Production of fluorspar concentrate declined somewhat at the Stollberg mine of AB Statsgruvor in central Sweden, the only producer in the country.

Sulfuric Acid.—In 1975, lessened demand caused cutbacks in Swedish sulfuric acid production. Construction continued at Boliden's Rönnskär smelter on a gas recovery system including a 140,000-ton-per-year sulfur dioxide plant to be completed by 1977.[17]

About 90% of Sweden's pyrites was produced by Boliden from metal mining operations. The remainder was by SKB's Falun lead-zinc-copper mine in central Sweden. Pyrites accounted for 80% of Swedish sulfuric acid production. Boliden produced pyrite-based acid at its Remersholm acid and fertilizer works near Remersholm in the southwest. Some of Boliden's acid was produced at the Rönnskär smelter at Skelleftehamn in the north from smelter gases.

MINERAL FUELS

Energy.—Hydroelectric power and fuelwood were the main sources of primary energy produced in Sweden in 1975. They supplied about one-fifth of all energy needs. All other fuels were imported in the form of crude oil, petroleum products, coal and coke, and enriched uranium fuel.

In 1975, the Swedish Parliament enacted a comprehensive energy policy for Sweden, in accordance with which growth in Sweden's energy consumption would be limited to 2% per year until 1985. Within this total, however, electrical energy consumption was to be permitted to grow at the rate of about 6% per year. The 1975 decision was the result of Sweden's dependence on imported oil as well as the risks and opportunities entailed by nuclear power. Nuclear power and some power generated in oil-fired powerplants is to account for the main part of the increase in production of electrical energy until 1985, when nuclear power capacity is to reach 10,400 megawatts. There was to be further emphasis on economy measures supported by taxation of fuels. About $88 million was allotted for energy research and development for a 3-year period.

Table 4 shows supply and apparent consumption of energy for 1974 and 1975.

Coal and Coke.—In 1975, Sweden continued to import most of the coal, coke, and lignite used in the country. However, about one-third of the country's metallurgical coke requirements were prepared

[16] Information received from W. F. Stowasser at World Bank, Washington, D.C., Oct. 15, 1975.
[17] Sulfur (London). New Plants and Projects. Sweden. No. 120. September–October 1975, p. 17.

Table 4.—Sweden: Supply and apparent consumption of energy-producing materials for 1974 and 1975

(Million tons of standard coal equivalent)[1]

	Total energy	Coal and coke	Petrolum and refinery products	Black liquor, fuelwood, and waste	Hydro-electric power [2]	Nuclear power [3]
1974:						
Production [4]	10.9	(5)	--	3.8	7.1	--
Imports	49.2	2.9	44.6	--	.8	0.9
Exports	2.4	.1	1.8	--	.5	--
Apparent consumption	57.7	2.8	42.8	3.8	7.4	.9
1975: p						
Production [4]	12.4	.1	--	5.2	7.1	--
Imports	55.0	2.7	47.0	--	.8	4.5
Exports	5.4	(5)	4.7	--	.7	--
Apparent consumption	62.0	2.8	42.3	5.2	7.2	4.5

p Preliminary.
[1] 1 ton of standard coal equivalent (SCE) = 7,000,000 kilocalories.
[2] Includes foreign trade of all electric power.
[3] Thermal burnoff of imported uranium fuel.
[4] Includes only primary energy.
[5] Insignificant.

Source: U.S. Embassy, Stockholm. State Department Dispatch T–2487, May 5, 1976, p. 2. Statistiska Meddelanden. Foreign Trade in 1975 (Preliminary). Apr. 20, 1976, pp. 4, 6. Energy. Feb. 11, 1976, p. 4. Swedish Institute. Energy Supply in Sweden. FS 37, August 1976.

domestically from imported coking coal and used in the iron and steel industry. Höganäs, AB, the country's only coal producer, produced marginal quantities from the Skäne area north of Lake Vänern.

Hydroelectric Power.—Present installations have a capacity of 12,900 megawatts of hydroelectric power and produced about 58 million megawatt-hours in 1975. Sweden's total possible hydroelectric power potential has been estimated at 95 million megawatt-hours per year. However, official policy limits any further growth in exploitation to 66 million megawatt-hours per year up to 1985 in order to safeguard the scenic and recreational resources of the country.[18]

Nuclear Power.—In 1975, Sweden had five installed nuclear powerplants, three of them completed during the current year. The plants had a cumulative design capacity of 3,180 megawatts and were all located in the densely populated southern part of the country. Plants completed before 1975 included Oskarshamn 1 and 2 on the east coast about 250 kilometers south of Stockholm. Plants completed in 1975 were Barsebäck 1, at Öresund near Malmö, and Ringhals 1 and 2, on the west coast about midway between Göteborg and Varberg. Plants under construction were Barsebäck 2, Ringhals 3 and 4, and Fosmark 1 and 2. The last two plants are near Gävle on the east coast about 150 kilometers north of Stockholm.[19] In 1975, the Swedish Parliament granted permission for the construction of three additional plants with at least one located at Fosmark (No. 3). This will increase the number of powerplants operating in 1985 to 13, with a total capacity of about 10,400 megawatts.[20] Technical data on Swedish nuclear powerplants in 1975 are shown in table 5.

Peat.—In 1975, a development project was underway at an unspecified location to operate a pilot plant for district heating based on the burning of peat. Sweden continued as a modest producer of peat. About two-thirds of it was used for agricultural purposes; the rest as fuel. In 1975, 6 million hectares of Sweden was covered by peat bogs, the fuel content of which was estimated at up to 6 billion tons of standard coal equivalent.[21]

Petroleum.—*Exploration and Production.*—Marginal crude oil production started in June on the Island of Gotland in the Baltic Sea. Oljeprospectering AB (OPAB), a State-controlled exploration company, found minor accumulations of oil and operated four pumped wells. The largest of these, the Hamra 8A located in the south, produced 37 barrels per day of oil. One-third of the 40 holes drilled by mid-1975 in Gotland showed signs of oil. Oil was also found at Hamra's seaward extension and was estimated to have a 2-million-ton-per-year production potential.[22] In 1975, through its subsidiary, Petroswede AB, OPAB continued prospecting for oil abroad including in the North Sea, Egypt, and Tunisia.

Svenska Petroleum AB agreed to assume one-half the share of Santa Fe International Corp.'s development costs in the Thistle Field located in the United King-

[18] Nuclear Sweden (Stockholm). Swedish Atomic Forum. 1976, 31 pp.
[19] Swedish Institute. Energy Supply in Sweden. FS 37, September 1976, p. 1.
[20] Work cited in footnote 18.
[21] Page 1 of work cited in footnote 19.
[22] Petroleum Economist (London). Sweden. OK Enters Refining. July 1975, p. 270.

Table 5.—Technical data on nuclear powerplants in Sweden in 1975

Name of powerplant	Plant No.	Net electrical output, megawatts	Reactor type	Start commercial operation
Oskarshamn	1	440	Boiling water	1971
	2	580	do	1974
Barsebäck	1, 2	580	do	1975–77
Ringhals	1	760	do	1976
	2	820	Pressurized water	1975
	3, 4	912	do	1977–79
Fosmark	1, 2	900	Boiling water	1978–80
	3	NA	do	1982

NA Not available.

Source: Nuclear Sweden (Stockholm), 1976.

dom's sector of the North Sea. In return, the Swedish State-owned oil company is to receive 25% of Santa Fe's interest in the field and an option to buy another 25% of the crude produced.[23]

Refining.—In 1975, Sweden continued to depend on imported oil and petroleum products for about 68% of its energy requirements. About 60% of the oil imported was crude oil used as refinery feedstock in domestic refineries.

Expansion in the petroleum industry included completion of Swedish-owned Nynäs Petroleum's lubricating-oil hydrofinisher at its Nynäshamn refinery located near Stockholm.

Construction continued on State-owned Statsföretag's 7-million-ton-per-year refinery on the west coast at Lysekill. Nynäs Petroleum continued planning its 10-million-ton-per-year refinery.

In 1975, there were six refineries in Sweden with a total throughput capacity of about 20.7 million tons per year.[24] The largest refinery was the 8.3-million-ton-per-year Lysekill plant on the west coast, operated by AB Scanraff; BP Raffinaderi AB operated the 5.5-million-ton-per year Göteborg (west coast) refinery; Koppartrans Olje AB (Shell) operated a 5-million-ton-per-year refinery, also located in Göteborg. Finally, Nynäs Petroleum operated the 1.4-million-ton-per-year Nynäshamn refinery near Stockholm, and the 284,000-ton-per-year Göteborg and 190,000-ton-per-year Malmö refineries on the west coast.

The Swedish and Norwegian Governments concluded an agreement to coordinate the oil industries of the two countries. A joint committee is to explore alternative refinery locations and the distribution of Norwegian oil products in Sweden. Alternatives to be considered include jointly financed expansion of the Norwegian oil refinery at Mongstadt, and expanding the old or building a new refinery at the State-owned Brofjord refinery north of Göteborg in Sweden. The plan for a catalytic cracker at Stenungsund, also north of Göteborg, is to be compared with the possibility of building a plant based on wet gas from the Statfjord Field at Sotra near Bergen in Norway, to supply both countries with petrochemical feedstock.[25]

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[23] Oil and Gas Journal. Dec. 22, 1975.
[24] International Petroleum Encyclopedia 1975. Petr. Publ. Co. (Tulsa), 1976, p. 318.
[25] Financial Times (London). Mar. 3, 1976, p. 4.

The Mineral Industry of Switzerland

By Roman V. Sondermayer [1]

During 1975 Switzerland continued to be a modest processor of imported crude oil, alumina, and raw materials for iron and steel production. Imports of metals were vital to the Swiss economy. In addition, Switzerland produced cement, lime, gypsum, salt, stone, sand, and gravel from domestic sources. Most of the country's energy requirements were met by imports of high-rank coals, crude oil, natural gas, nuclear fuels, and some petroleum refinery products. Hydroelectric power and fuelwood were the primary sources of energy produced in the country. The mineral industry of Switzerland was significant only to the domestic economy and contributed only about 2% of the gross national product (GNP) of about $55.3 billion. The inflation rate was 8%, Swiss unemployment remained under 1%, and Switzerland had a balance of payment surplus on current account in 1975. No major events relating to the minerals industry occurred during 1975.

PRODUCTION

Data on domestic production of mineral commodities showed a declining trend during 1975, reflecting a general slowdown of the economy. A large number of the processing facilities were modern and efficient. However, some of the installations for production of gypsum, lime, and stone were less mechanized than those in other parts of Europe. Productivity was rather high among mineral industry workers.

[1] Physical scientist, International Data and Analysis.

Table 1.—Switzerland: Production of mineral commodities

Commodity [1] and unit of measure	1973	1974	1975 p
METALS			
Aluminum smelter production, primary ---------- metric tons --	85,367	87,157	79,041
Iron and steel:			
Pig iron and blast furnace ferroalloys thousand metric tons --	26	35	34
Electric furnace ferroalloys e ---------- do ----	r 21	21	21
Crude steel ---------- do ----	584	593	441
Steel semimanufactures ---------- do ----	649	657	354
NONMETALS			
Cement, hydraulic ---------- do ----	5,756	5,253	3,765
Gypsum e ---------- do ----	100	100	70
Lime ---------- do ----	138	113	73
Salt ---------- do ----	299	307	237
MINERAL FUELS AND RELATED MATERIALS			
Coke, gashouse ---------- do ----	r 118	40	--
Gas, manufactured ---------- million cubic feet --	14,854	10,819	4,322
Petroleum refinery products:			
Gasoline ---------- thousand 42-gallon barrels --	7,854	8,284	7,293
Jet fuel ---------- do ----	992	1,168	1,288
Kerosine ---------- do ----	31	31	39

See footnotes at end of table.

Table 1.—Switzerland: Production of mineral commodities—Continued

Commodity [1] and unit of measure	1973	1974	1975 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum refinery products—Continued			
Distillate fuel oil ---- thousand 42-gallon barrels	17,725	18,195	14,286
Residual fuel oil ---- do	13,646	11,102	7,626
Other:			
Liquefied petroleum gas ---- do	1,009	1,148	1,172
Unspecified ---- do	2,149	2,158	1,558
Refinery fuel and losses ---- do	1,587	2,365	1,876
Total ---- do	44,993	44,451	35,138

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

[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.

TRADE

During 1975 Switzerland's imports consisted mainly of fuels and raw mineral products for the metal processing industry. Exports included metals, cement, and petroleum refinery products. Tables 2 and 3 show recent foreign trade data of Switzerland. The volume of imports and exports of mineral commodities showed a general downward trend during 1975.

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

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite and concentrate	12	--	
Oxide and hydroxide	147	219	United Kingdom 43; Finland 33; West Germany 26.
Metal including alloys:			
Unwrought	24,073	23,135	West Germany 10,293; Italy 6,330.
Semimanufactures	44,511	51,024	Austria 5,165; United Kingdom 5,147; Denmark 3,811.
Antimony metal including alloys, unwrought ---- kilograms	92	2,216	Bangladesh 2,000.
Arsenic trioxide, pentoxide, acids ---- do	7,533	5,015	NA.
Beryllium metal including alloys, all forms ---- do	254	552	United States 431.
Chromium oxide and hydroxide ---- do	14,134	12,184	West Germany 5,406; Austria 4,541.
Copper:			
Matte	1,617	1,005	West Germany 773; Netherlands 201; Belgium-Luxembourg 22.
Copper sulfate	167	170	West Germany 91; Austria 54.
Metal including alloys:			
Scrap	19,114	15,034	West Germany 6,516; Belgium-Luxembourg 2,404; Austria 2,121.
Unwrought	[r] 4,547	4,216	Italy 2,757; West Germany 1,229.
Semimanufactures	11,154	10,773	Israel 1,657; Italy 1,625; United States 1,542.
Gold metal, unworked or partly worked ---- thousand troy ounces	595	1,043	Austria 483; West Germany 352.
Iron and steel:			
Ore and concentrate, including roasted pyrite	3,737	33	West Germany 17.
Metal:			
Scrap	109,421	116,999	Italy 95,791; West Germany 11,165.
Pig iron, ferroalloys, similar materials	3,739	2,476	Italy 932; Austria 681; West Germany 436.
Ferroalloys	3,646	2,027	Austria 674; Italy 577; West Germany 375.
Steel, primary forms	1,018	2,015	Italy 1,294; West Germany 714.
Semimanufactures	135,694	231,709	Austria 56,393; West Germany 32,863; Italy 28,314.

See footnote at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Lead:			
Oxides	5	70	Austria 69.
Metal including alloys:			
Scrap	9,606	9,105	Italy 4,036; Austria 2,641.
Unwrought	1,359	1,391	Italy 891; Austria 256; France 155.
Semimanufactures	122	56	Belgium-Luxembourg 26; Italy 12.
Magnesium metal including alloys, all forms	248	259	West Germany 71; Sweden 70; Italy 29.
Manganese oxides	1	11	Sweden 8.
Mercury 76-pound flasks	298	141	France 98.
Molybdenum metal including alloys, all forms	1	1	All to West Germany.
Nickel:			
Matte, speiss, similar materials	38	225	West Germany 169.
Metal including alloys:			
Scrap	751	843	West Germany 504; Italy 150; United States 94.
Unwrought and semimanufactures	864	1,314	West Germany 294; Italy 165; Ireland 135.
Platinum-group metals and silver, including alloys:			
Platinum group thousand troy ounces	336	393	Netherlands 79; Japan 65; West Germany 63.
Silver do	37,531	37,841	Italy 17,490; Austria 4,694.
Tin metal including alloys:			
Scrap	141	55	West Germany 36; France 19.
Unwrought	106	123	France 45; West Germany 42; Netherlands 13.
Semimanufactures	47	42	Austria 10; West Germany 7; Sweden 6.
Titanium oxides	485	373	France 96; West Germany 47.
Tungsten metal including alloys, all forms	66	97	West Germany 84.
Uranium and thorium oxides, including rare-earth oxides kilograms	1,650	1,307	Italy 137; Netherlands 124; Poland 119.
Zinc:			
Oxide	2	4	Philippines 2.
Metal including alloys:			
Scrap	1,231	1,251	Italy 636; France 238; West Germany 194.
Unwrought	396	587	France 172; West Germany 147; Netherlands 94.
Semimanufactures	155	333	West Germany 284.
Other:			
Ore and concentrates	175	193	Yugoslavia 90; Greece 25; Netherlands 24.
Ash and residue containing nonferrous metals	21,284	24,795	West Germany 11,829; Italy 7,051.
Waste and sweepings of precious metals	144	229	West Germany 164; France 53.
Oxides, hydroxides, peroxides of metals, n.e.s	1,847	361	Italy 187; United Kingdom 84; Netherlands 36.
Metals including alloys, all forms:			
Metalloids	8,455	11,273	West Germany 6,333; United States 2,099.
Alkali, alkaline earths, rare-earth metals kilograms	2,699	1,609	India 625.
Phosphoric alloys do	288	2,565	West Germany 160.
Base metals including alloys, all forms, n.e.s	81	132	West Germany 71; Belgium-Luxembourg 16.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	17	16	West Germany 5; Italy 5.
Dust and powder of precious and semiprecious stones kilograms	3,328	3,272	West Germany 1,568.
Grinding and polishing wheels and stones	1,015	970	United Kingdom 189; West Germany 178.

Table 2.—Switzerland: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Asbestos	30	136	Italy 101.
Barite and witherite	3	(1)	NA.
Boron materials:			
Crude natural borates	(1)	7	Greece 3; West Germany 2.
Oxide and acid	6	26	West Germany 10; United States 10.
Cement	64,567	30,986	West Germany 21,021; France 8,986.
Chalk	121	141	France 91; West Germany 21.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	16,272	12,239	West Germany 10,881.
Products:			
Refractory (including nonclay bricks)	1,143	654	Austria 434; Italy 114.
Nonrefractory	40,312	44,459	West Germany 15,333; France 13,658; Austria 10,709.
Cryolite and chiolite kilograms	12,221	23,600	Iran 12,000; Italy 10,000.
Diamond:			
Gem, net set or strung value, thousands	$51,708	$66,371	France $16,137; Italy $8,917; Belgium-Luxembourg $8,430.
Industrial do	$2,424	$2,128	West Germany $940; Japan $635.
Diatomite and other infusorial earth	44	13	France 2.
Feldspar and fluorspar	227	288	West Germany 160; Sweden 58; Peru 50.
Fertilizer materials:			
Manufactured:			
Nitrogenous	486	936	West Germany 200; Argentina 123.
Phosphatic	17	1	NA.
Potassic	(1)	17	France 1.
Other including mixed	1,168	1,847	West Germany 945; France 291.
Ammonia	73	79	Austria 63; France 8.
Graphite, natural	7	14	West Germany 8.
Gypsum and plasters	6,538	5,574	Austria 5,527.
Lime	5,262	5,210	West Germany 3,850; France 1,336.
Magnesite	72	--	
Mica:			
Crude including splittings and waste	90	87	Peru 23; Belgium-Luxembourg 14; West Germany 9.
Worked	378	443	Sweden 76; United Kingdom 65.
Pigments, mineral:			
Natural, crude	49	58	Peru 25; United States 15; Iran 13.
Iron oxides, processed	62	108	France 41; Austria 40; Italy 12.
Precious and semiprecious stones, except diamond:			
Natural, crude thousand carats	37,975	23,835	India 5,490; Lebanon 2,470.
Manufactured do	332	237	West Germany 62; U.S.S.R. 57.
Pyrite (gross weight) kilograms	100	--	
Salt and brine	37	3,250	Austria 1,307; France 885.
Sodium and potassium compounds, n.e.s	35,245	51,026	West Germany 11,268; France 8,511; Italy 6,560.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	36,967	37,814	West Germany 27,168; Italy 5,645.
Worked	12,997	11,877	West Germany 10,758.
Dolomite, chiefly refractory grade	46	27	West Germany 7.
Gravel and crushed rock	23,464	51,031	West Germany 37,820; France 9,120.
Limestone (except dimension)	51	4	West Germany 3.
Quartz and quartzite	32,422	39,876	Italy 35,424.
Sand, excluding metal bearing	12,693	13,858	France 7,133; West Germany 4,015; Italy 2,301.
Sulfur:			
Elemental, all forms	158	166	West Germany 124; France 27.
Sulfur dioxide	148	220	West Germany 156; Austria 61.
Sulfuric acid	32,162	33,114	West Germany 15,677; France 14,511.
Talc, steatite, soapstone, pyrophyllite	1,256	1,055	Italy 925; Austria 106.
Other nonmetals, n.e.s.:			
Crude	541	3,490	Tunisia 2,138; Italy 478; West Germany 466.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	2,726	4,906	West Germany 4,307; France 573.
Slag and ash n.e.s	(1)	238	Italy 218; France 20.
Oxides and hydroxides of magnesium, strontium, barium	12	22	West Germany 7; Iran 6; Spain 4; Italy 2.

See footnotes at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Other nonmetals, n.e.s—Continued			
Bromine, iodine, fluorine	23	56	Ireland 50.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	768	428	France 250; Netherlands 47.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	7	10	NA.
Carbon black and gas carbon:			
Carbon black	122	59	West Germany 27; U.S.S.R. 9; France 6.
Gas carbon kilograms	1	1	NA.
Coal, all grades, including briquets	2,599	33,693	West Germany 31,069.
Coke and semicoke	28,718	47,266	France 24,264; Austria 12,777.
Gas, hydrocarbon, manufactured	91	97	All to France.
Hydrogen, helium, rare gases	110	63	Austria 54.
Peat, including peat briquets and litter	1,523	1,115	Austria 732; France 373.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	18	5	Mainly to Austria.
Kerosine and white spirit do	(1)	1	All to Austria.
Distillate fuel oil do	59	104	Do.
Residual fuel oil do	1,463	1,092	Austria 779; West Germany 240.
Lubricants do	55	44	Yugoslavia 9; France 5; West Germany 4.
Other:			
Liquefied petroleum gas do	25	164	Italy 89; Austria 62.
Unspecified do	6	15	France 7; West Germany 4.
Total do	1,626	1,425	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	5,659	5,118	West Germany 3,819; France 857.

NA Not available.
[1] Less than ½ unit.

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

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	9,924	15,990	France 10,835; Italy 4,824.
Oxide and hydroxide	145,355	198,438	Australia 148,176; Guinea 43,655.
Metal including alloys:			
Unwrought	29,371	41,600	Iceland 21,727; Norway 12,739.
Semimanufactures	21,649	25,285	West Germany 7,607; Norway 3,936; Sweden 3,119.
Antimony metal including alloys, unwrought	95	62	Italy 30; People's Republic of China 26.
Arsenic trioxide, pentoxide, acids	48	58	France 56.
Beryllium metal including alloys, all forms kilograms	556	725	United States 618; United Kingdom 96.
Chromium:			
Chromite	3,437	5,002	Republic of South Africa 4,225.
Oxide and hydroxide	522	586	West Germany 426; Italy 78.
Cobalt oxide and hydroxide	6	15	Belgium-Luxembourg 12.
Columbium, tantalum metal including alloys, all forms, tantalum	3	4	United States 3.
Copper:			
Matte	27,086	31,176	Belgium-Luxembourg 10,749; West Germany 7,138; Zambia 3,181.
Copper sulfate	1,091	722	Bulgaria 216; U.S.S.R. 208; France 119.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Copper—Continued			
Metal including alloys:			
Scrap	505	1,986	West Germany 915; Israel 659; United States 203.
Unwrought	1,233	1,438	West Germany 782; United Kingdom 327; Belgium-Luxembourg 208.
Semimanufactures	42,353	57,102	United Kingdom 20,043; West Germany 16,573; Austria 5,679.
Gold metal, unworked or partly worked thousand troy ounces	137	140	West Germany 36; United Kingdom 31; Italy 17.
Iron and steel:			
Ore and concentrate, including roasted pyrite	28,466	39,489	Mauritania 29,833; Italy 7,464.
Metal:			
Scrap	63,396	110,355	West Germany 95,065.
Pig iron and similar materials	83,193	80,739	West Germany 48,471; France 15,135.
Ferroalloys	20,499	27,483	Norway 7,605; France 6,272; West Germany 4,332.
Steel, primary forms	170,070	160,707	West Germany 55,637; France 41,046; Belgium-Luxembourg 26,045.
Semimanufactures:			
Bars, rods, angles, shapes, sections:			
Wire rods thousand tons	141	118	West Germany 54; France 44.
Other bars and rods do	220	247	West Germany 109; France 39.
Angles, shapes, sections do	258	210	West Germany 72; France 68; Belgium-Luxembourg 55.
Universals, plates, sheets do	679	658	West Germany 247; France 155; Netherlands 61.
Hoop and strip do	223	192	West Germany 59; Belgium-Luxembourg 51; France 28.
Rails and accessories do	49	56	Austria 33; West Germany 7; France 7.
Wire do	48	45	Austria 17; West Germany 15.
Tubes, pipes, fittings do	271	170	West Germany 74; France 26; Austria 23.
Castings and forgings, rough do	4	3	West Germany 1; Belgium-Luxembourg 1; France 1.
Total do	1,888	1,699	
Lead:			
Ore and concentrate	(1)	4	NA.
Oxides	197	161	Mexico 90; West Germany 42.
Metal including alloys:			
Scrap	8	46	France 41; West Germany 4.
Unwrought	17,034	22,378	United Kingdom 8,056; France 3,882; West Germany 3,369.
Semimanufactures	1,295	1,550	West Germany 1,447.
Magnesium metal including alloys, all forms	2,059	1,808	Norway 1,073; West Germany 184.
Manganese oxides	663	730	Japan 439; Belgium-Luxembourg 227.
Mercury 76-pound flasks	324	590	West Germany 260; U.S.S.R. 125; Spain 101.
Molybdenum metal including alloys, all forms	76	22	Austria 8; Belgium-Luxembourg 5; United States 4.
Nickel:			
Matte, speiss, similar materials	1,077	1,336	Norway 364; United Kingdom 288; Canada 249.
Metal including alloys:			
Scrap	27	56	Austria 37; United Kingdom 19.

See footnotes at end of table.

Table 3.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Nickel—Continued			
Metal including alloys—Continued			
Unwrought	1,059	1,254	Norway 340; United Kingdom 288; Canada 235.
Semimanufactures	1,667	2,253	West Germany 843; United Kingdom 462; United States 432.
Platinum-group metals and silver including alloys:			
Platinum group thousand troy ounces	354	530	West Germany 128; Netherlands 125; United Kingdom 79.
Silver do	8,735	16,011	United States 3,504; West Germany 2,894; France 2,090.
Tantalum metal including alloys, all forms	3	4	United States 3.
Tin:			
Oxides	28	38	France 26; United Kingdom 9; West Germany 3.
Metal including alloys:			
Scrap	14	15	West Germany 13.
Unwrought	893	808	Thailand 290; United Kingdom 155; Indonesia 132.
Semimanufactures	283	243	West Germany 100; Netherlands 53; Belgium-Luxembourg 41.
Titanium oxides	11,892	11,139	West Germany 2,866; France 2,392; United Kingdom 2,297.
Tungsten:			
Ore and concentrate	40	60	All from Portugal.
Metal including alloys, all forms	99	127	West Germany 99; United Kingdom 14.
Uranium and thorium oxides including rare-earth oxides	11	14	France 4; Austria 3; West Germany 3.
Zinc:			
Ore and concentrate	128	(1)	NA.
Oxide	2,461	2,349	West Germany 819; Canada 469; France 425.
Metal including alloys:			
Scrap	107	75	West Germany 60; Italy 15.
Blue powder	3,037	2,165	Belgium-Luxembourg 711; West Germany 490; France 385.
Unwrought	28,436	24,895	West Germany 5,193; France 3,375; Belgium-Luxembourg 2,911.
Semimanufactures	5,419	3,481	West Germany 1,922; Belgium-Luxembourg 1,088.
Other:			
Ore and concentrate	2,440	7,665	Republic of South Africa 4,252; Australia 2,115.
Ash and residue containing nonferrous metals	466	642	West Germany 336; France 257.
Waste and sweepings of precious metals	9	28	France 16; Denmark 3; Italy 2.
Oxides, hydroxides, peroxides of metals, n.e.s	2,587	6,117	West Germany 5,832.
Metals including alloys, all forms:			
Metalloids	2,456	3,712	Netherlands 1,128; France 967; West Germany 783.
Alkali, alkaline earth and rare-earth metals	428	493	West Germany 432; United States 59.
Pyrophoric alloys	8	18	Austria 11; United Kingdom 4.
Base metals including alloys, all forms, n.e.s	666	732	Republic of South Africa 187; France 143; Japan 86.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	2,013	1,511	West Germany 696; Italy 525; United States 200.
Dust and powder of precious and semiprecious stones kilograms	1,272	1,397	Ireland 707; United Kingdom 310; United States 229.
Grinding and polishing wheels and stones	1,623	1,846	West Germany 782; Austria 245; United Kingdom 190.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Asbestos	19,730	17,731	Canada 7,023; U.S.S.R. 3,676; Italy 3,364.
Barite and witherite	4,405	3,306	West Germany 1,865; France 1,283.
Boron materials:			
Crude natural borates	2,449	2,236	United States 1,548; France 389; Netherlands 273.
Oxide and acid	1,029	1,005	United States 292; France 281; Turkey 234.
Cement	431,939	166,025	Italy 77,335; France 51,271; West Germany 26,439.
Chalk	21,416	22,142	France 18,996.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	206,296	230,269	West Germany 87,722; United Kingdom 65,089; France 40,404.
Products:			
Refractory (including nonclay bricks)	35,371	41,700	West Germany 19,460.
Nonrefractory	329,185	256,476	Italy 183,709; West Germany 39,090.
Cryolite and chiolite	465	1,110	All from Denmark.
Diamond:			
Gem, not set or strung value, thousands	$88,586	$100,260	Belgium-Luxembourg $33,954; United States $18,295.
Industrial do	$3,834	$3,275	West Germany $1,623; Belgium-Luxembourg $886.
Diatomite and other infusorial earth	2,853	3,230	France 942; Denmark 815; United States 509.
Feldspar and fluorspar	17,366	18,391	West Germany 5,572; Norway 4,592; Italy 4,423.
Fertilizer materials:			
Crude:			
Nitrogenous	170	255	West Germany 150; Italy 80; Poland 25.
Phosphatic	18,833	13,799	Monaco 8,982; Belgium-Luxembourg 2,614; United States 1,925.
Potassic	79,190	88,054	France 81,776.
Other	17,093	14,373	France 13,143.
Manufactured:			
Nitrogenous	49,922	15,814	West Germany 12,357; Italy 2,016.
Phosphatic:			
Thomas (basic) slag	174,531	185,992	France 121,190; Belgium-Luxembourg 63,693.
Other	10,421	9,674	France 3,953; Belgium-Luxembourg 2,590; Netherlands 1,782.
Potassic	15,819	13,612	West Germany 10,382; France 2,902.
Other including mixed	86,098	92,234	France 40,425; West Germany 30,361.
Ammonia	11,273	16,632	Austria 12,639; France 3,167.
Graphite, natural	237	272	West Germany 186; Italy 45; Austria 30.
Gypsum and plasters	158,666	119,870	West Germany 63,421; Austria 23,007; France 18,020.
Lime	35,959	36,401	Italy 24,206; West Germany 10,588.
Magnesite	4,163	4,114	Austria 3,900.
Mica:			
Crude including splittings and waste	697	695	West Germany 299; India 280.
Worked including agglomerated splittings	268	345	France 245; Belgium-Luxembourg 86.
Pigments, mineral:			
Natural, crude	327	304	France 133; West Germany 66; Austria 65.
Iron oxides, processed	2,882	3,880	West Germany 3,599; United Kingdom 182.
Precious and semiprecious stones, except diamond:			
Natural, crude thousand carats	462,735	284,935	United States 95,175; Brazil 81,785; West Germany 35,140.
Manufactured do	142,940	97,820	France 90,520.
Pyrite (gross weight)	5,020	45,009	All from Italy.
Salt and brine	2,052	2,261	France 1,948.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	8,651	5,402	France 1,603; West Germany 1,325; Italy 1,512.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Sodium and potassium compounds, n.e.s—Continued			
Caustic potash, sodic, potassic peroxides	4,326	3,621	France 1,400; West Germany 904; Italy 645.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	32,799	35,197	Italy 21,755; France 7,041; Austria 4,757.
Slate	1,090	925	Italy 530; West Germany 319.
Other	71,218	82,103	West Germany 56,191; France 12,843; Italy 11,673.
Worked:			
Slate	1,362	1,337	Italy 972; West Germany 175.
Paving and flagstone	48,847	49,175	Italy 38,474; Austria 4,942.
Other	16,190	17,853	Italy 12,317.
Dolomite, chiefly refractory grade	12,987	15,698	Italy 11,272; France 3,481.
Gravel and crushed rock thousand tons	6,678	5,614	France 2,773; West Germany 1,452; Italy 905.
Limestone (except dimension)	65,956	30,047	France 27,708; Italy 1,833.
Quartz and quartzite	3,332	16,604	Italy 9,844; West Germany 3,201; Portugal 2,928.
Sand excluding metal bearing thousand tons	1,839	1,755	Italy 941; France 400; West Germany 240.
Sulfur:			
Elemental:			
Other than colloidal	50,648	44,072	West Germany 37,997.
Colloidal	324	358	West Germany 239; France 118.
Sulfur dioxide	28	34	Italy 26; West Germany 5.
Sulfuric acid, oleum	2,452	2,126	France 1,120; West Germany 783.
Talc, steatite, soapstone, pyrophyllite	14,142	14,018	Austria 7,797; France 3,642.
Other nonmetals, n.e.s:			
Crude:			
Pozzolan and santorin earth	5,824	6,965	France 3,849; West Germany 3,067.
Other	38,416	41,297	West Germany 22,092; France 9,772.
Slag, dross, similar waste, not metal bearing:			
From iron and steel manufacture	70,089	56,444	France 35,998; Belgium-Luxembourg 18,422.
Slag and ash, n.e.s	14,882	14,404	West Germany 13,473.
Oxides and hydroxides of magnesium, strontium, barium	429	450	United Kingdom 111; West Germany 83; France 78.
Bromine, iodine, and fluorine	2,373	2,706	France 1,076; United Kingdom 667; Israel 615.
Building materials of asphalt, asbestos, fiber cement, unfired nonmetals, n.e.s	18,270	15,657	West Germany 8,858; Austria 4,592.
MINERAL FUEL AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,625	1,835	Trinidad 1,272; France 321; United States 230.
Carbon black and gas carbon:			
Carbon black	10,327	8,836	West Germany 4,325; France 1,641; Netherlands 1,213.
Gas carbon	46	34	All from West Germany.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	133	243	West Germany 89; Poland 78.
Briquets of anthracite and bituminous coal do	22	23	West Germany 17; France 5.
Lignite and lignite briquets do	56	68	West Germany 64.
Coke and semicoke do	158	201	West Germany 143; France 27.
Gas, hydrocarbon, manufactured kilograms	1,366	1,178	West Germany 1,116.
Hydrogen, helium, rare gases	2,454	2,867	France 1,710; Italy 713; West Germany 374.
Peat including peat briquets and litter	51,210	60,816	West Germany 56,438.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	45,909	45,059	United Arab Emirates 15,571; Libya 7,120; Nigeria 6,305.

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

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline thousand 42-gallon barrels	14,388	12,961	France 4,242; Italy 3,681; West Germany 3,613.
Kerosine and white spirit do	885	600	Netherlands 82; France 60.
Distillate fuel oil do	40,150	34,972	France 12,249; Netherlands 7,572; U.S.S.R. 4,834.
Residual fuel oil do	4,651	3,969	France 2,351; West Germany 1,252.
Lubricants do	787	760	Italy 196; West Germany 160; France 105.
Mineral jelly and wax do	101	102	West Germany 68.
Other:			
Liquefied petroleum gas do	2,072	3,909	Netherlands 3,218; West Germany 684.
Unspecified do	3,004	893	Italy 441.
Total do	66,038	58,166	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	73,697	39,539	France 10,127; Netherlands 8,757; West Germany 6,952.

NA Not available.
[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—Two Swiss Aluminium Ltd. (Alusuisse) plants (one at Chippis, Valais, and the other at Steg, Valais) and one owned by Usine d'Aluminium at Martigny were in production during 1975. Imported alumina from Surinam, Guinea, and Australia was used for feed. Most of the domestic aluminum was consumed in the country; apparent consumption, in thousand tons, is given in the following tabulation:

	Apparent consumption
1970	90.7
1973	111.5
1974	105.0
1975	[e] 90.0

[e] Estimate.

Iron and Steel.—Four steel plants, (with a total capacity of about 700,000 tons per year), located at Bodio, Lucerne, Gerlafingen, and Wöhlen, produced about 400,000 tons of steel during 1975, or 20% of demand. The 1975 output was lower than that in 1974, a result of the general slowdown of the economy. A network of about 1,000 traders distributed domestic and imported steel to consumers. In Switzerland, some of the steel traders have elaborate facilities for decoiling, slitting, guillotining, and other methods for preparing steel to the customers' desired specifications.

Silicon.—Monteforno Acciaerie e Laminator's 8,000-ton-per-year ferrosilicon plant and Gothardwerke für Electrochemische Industrie's 800-ton-per-year ferrosilicon plant remained the only producers of ferrosilicon in the country during 1975. Both plants were located at Bodio in southeastern Switzerland. Imported raw materials from European countries were used as feedstock during 1975, however, data on output were not available.

NONMETALS

Cement.—During 1975, the 15 Swiss cement plants, with 6 million tons per year installed capacity, operated at 60% of capacity. Three of the plants were located in the canton of Argau; the cantons of Bern and Vaud had two each; and one cement plant was in each of the following cantons: Graubünden, St. Gallen, Neuchatel, Schaffhausen, Solothurn, Schwyz, Valais, and Ticino. In addition, four clinker grinding plants were operational. During

1975 there were no major changes in capacity or equipment. Lower production resulted from a slowdown in the building sector of the economy.

Lime and Other Building Materials.—Production and consumption of lime and other construction materials, such as stone, sand, and gravel, followed the generally lower trend of cement.

MINERAL FUELS

The Swiss Federal Office for Energy Policy (L'Office Federal de l'Economie Energetique—OFEE) in its annual report indicated a decline in energy consumption of 2.5% compared with that of 1974. Petroleum remained the principal source of energy. Hydropower and natural gas followed.

Reliance was being placed on nuclear power to lower dependence on imported hydrocarbons. Construction of a nuclear powerplant at Gosgen, north of Brig, proceeded according to schedule, and production was expected in 1977.

Petroleum.—There was no domestic production of petroleum in Switzerland. However, exploration, mostly seismic, was underway in various parts of the country (cantons of Fribourg, Bern, Lucerne, Zug, Schwyz, Glaris, and St. Gallen). Seismic work which started during 1974 was continued. A total of 640 kilometers of seismic profiles was completed at the concession of Petrol Suisse S.A., Zurich, and Petrol de Lucerne, Lucerne. These two companies conducted exploration in the cantons of Zug, Schwyz, and Lucerne. Exploration was related to the Molasse formation of Miocene age, which is composed of Alpine detritus and is extensively developed in northern Switzerland. There was no actual drilling for petroleum in Switzerland during 1975.

The country's three refineries operated at 72% of installed capacity during the year. Two of them processed crude oil and the newest, the Raffinerie Rheintal located in the Rhine Valley and onstream since 1974, processed topped crude oil supplied through the Central Europe Pipeline. The Raffinerie de Sud-Ouest S.A., located at Collombey-Muraz, processed about 2.1 million tons or 27% less than in 1974. The Raffinerie de Cressier S.A., located at Cressier, processed about 2.6 million tons during 1975 or 16% less than during 1974.

Table 4.—Switzerland: Supply and apparent consumption of energy materials in 1973 and 1974
(Million tons of standard coal equivalent) [1]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Fuelwood	Hydro-electric power	Nuclear power
1973:							
Production	4.2	--	--	--	(2)	3.5	0.7
Imports	23.4	0.3	22.0	0.4	(2)	.7	--
Exports	1.2	(2)	.3	--	(2)	.9	--
Apparent consumption	26.4	.3	21.7	.4	(2)	3.3	.7
1974:							
Production	4.4	--	--	--	(2)	3.6	.8
Imports	22.7	.3	20.7	.9	(2)	.8	NA
Exports	1.5	(2)	0.3	--	(2)	1.2	NA
Apparent consumption	25.6	.3	20.4	.9	(2)	3.2	.8

NA Not available.
[1] 1 ton of standard coal equivalent (SCE) = 7,000,000 kilocalories.
[2] Less than 0.005 million tons of SCE.

The Mineral Industry of Taiwan

By E. Chin [1]

Taiwan's gross national product (GNP) for 1975 was estimated at $14.4 billion at current prices and at $8.9 billion at 1971 prices, compared with $13.8 billion and $8.7 billion, respectively, for 1974. In absolute values, the growth in GNP for 1975 was 2.8%, compared with 0.6% for 1974 and 11.9% for 1973. The average annual growth rate for 1969–72 was 10.7%. As in many countries, the higher costs for fuels and other raw materials caused economic dislocation, as evidenced by a slowdown in real growth in GNP during 1974–75.

The value of Taiwan's imports and processing activities for minerals and metals overshadowed values of indigenous extraction. The mineral processing sector outweighed the domestic mining sector by 16 to 1 in output value. The total industrial input into the GNP was $4.1 million,[2] and by sector was constituted as follows, in percent: Mining 1.1; manufacturing, 27.0; utilities, 2.6; and construction, 5.6. Agriculture, forestry, fishery, and livestock contributed 16.3% to the GNP, followed by commerce and banking, 15.8%, and transportation and communications, 5.8%. The remainder comprised real estate, Government expenditure, and other services.

The breakdown by value of output for specific mineral-related sectors, in million U.S. dollars, follows:

Economic sector	1974	1975
Overall mining:		
Coal	129	102
Metals	29	25
Oil and natural gas	99	99
Salt evaporation	4	4
Nonmetals and quarrying	24	25
Total	285	255

Economic sector	1974	1975
Manufacturing of mineral and related products:		
Chemical products	1,786	2,076
Oil and coal products	930	1,016
Nonmetallic mineral products	364	422
Basic metals	651	479
Metal products	140	137
Total	3,871	4,130

Coal, natural gas, and limestone (including marble), ranked by value, are the three leading mineral products mined in Taiwan. However, output of these minerals is not significant in terms of the world market. The reserves of the important economic minerals in Taiwan in 1974, as reported by the Industrial Technology Research Institute, follow, in million tons: Asbestos, 0.88; copper ore, 15.1; dolomite, 119.2; gold ore, 7.0; marble, 299,980.0; pyrite, 1.9; sulfur, 2.4; and talc, 2.4. Additionally, reserves of mineral fuels were coal, 222.7 million tons; petroleum, 3.9 kiloliters; and natural gas, 41.4 billion cubic meters.[3]

Despite the sluggish growth of the economy during 1974–75, Taiwan continued the planning and construction of its 10 major development projects.[4] The first project to be started was the North-South Freeway linking Keelung in the north with Kaohsiung in the south. Completion of the 232-mile freeway was expected in late

[1] Physical scientist, International Data and Analysis.

[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] Mineral Resource Development in Taiwan. Mining Research and Service Organization Industrial Technology Research Institute. October 1975. P. 33.

[4] Industry of Free China. The Republic of China Builds for Tomorrow: The Ten Major Development Projects. V. 44, No. 2, August 1975, pp. 18–25.

1978. The highway would also provide high-speed access to the new international airport, another of the major projects, which is being constructed on the west coast near Taoyuan, about 18 miles southwest of Taipei. Completion of the airport was scheduled for 1979.

The railroad on the west coast mainline was being extended from Suao on the northeast coast to Hualien, the principal city at the northern end of the east coast plain. A link will be made with the existing east coast line connecting Hualien with Taitung to the south. Construction of the railroad will end the relative inaccessibility of the Hualien-Taitung area to the rest of Taiwan. The east coast has marble reserves estimated at about 300 million tons, and limestone and dolomite are plentiful. A cement mill currently under construction was scheduled for completion in late 1978.

Another project, the electrification of the west coast mainline railroad from Keelung to Kaohsiung, was scheduled for completion by 1979. Orders were placed for 94 locomotives to service passenger traffic and cargo and freight transport between Keelung and Chunan, Chunan and Changhua, and Changhua and Kaohsiung. Electrification was expected to reduce fuel oil imports in 1977 when the availability of power from nuclear generators would begin.

Construction continued on the first nuclear powerplant in northern Taiwan. Generation from a 636,000-kilowatt unit was expected by early 1977, and a second unit with identical capacity was to be completed by 1978. A second nuclear plant with two 985,000-kilowatt units was also planned for construction on the coast near the first plant site. A third plant with two units of 950,000 kilowatts each was also proposed for this nuclear project. At yearend 1975, Taiwan's 30 hydroelectric plants had a total capacity of about 1.4 million kilowatts. The largest thermal powerplant, at Taling near Kaohsiung, was completed in 1975 and has a capacity of 1.85 million kilowatts.

Two projects involving a new harbor and expansion of an existing port were in progress. A new harbor was being constructed in central Taiwan near Taichung. When completed in 1976, Taichung Harbor will accommodate nearly 3 million tons of cargo annually. Further expansion to 12 million tons per year was scheduled by 1982 and would provide relief from overcrowding at Keelung in the north and Kaohsiung in the south. An industrial district was also planned for Taichung, which would include a power station, a shipyard, and petrochemical plants. Suao, a fishing port on the northeast coast, was being enlarged to increase its capacity to 6.5 million tons of cargo by 1981.

Projects involving the petrochemical industry include expanding the production of basic petrochemical raw materials and the production of intermediate and consumer products. Two naphtha crackers have been constructed. The second, completed in 1975, will produce 230,000 tons of ethylene, and a third plant of equal size was being constructed. During 1975, a 66,000-ton polyacrylonitrile plant was completed for fiber processing. A polyester plant and a caprolactam plant were nearing completion.

China Steel Corp. was constructing an integrated steel mill at Kaohsiung. When completed in 1978, annual production capacity would be 150,000 tons of pig iron, 245,000 tons of steel ingot, and 1 million tons of steel plates, wires, and rods.

China Shipbuilding Corp. continued construction of its shipyard at Kaohsiung, which will have an annual capacity of 1.5 million tons of construction. When completed, the dry dock, which will handle vessels up to 1 million tons, will be 950 meters long and 92 meters wide. A second harbor entrance was included in the Kaohsiung expansion program, whereby port facilities could be enlarged to handle 100 million tons of cargo annually, facilitating the operation of the new shipyard in both shipbuilding and ship repair.

Late in the year, the Economic Planning Council completed the conceptual framework for the 6-year (1976–81) economic development plan for submission and approval by the Executive Yuan. The objectives of this new plan were to improve economic structure, promote economic modernization, expedite development of economic resources, and strengthen the ability of the economy to adapt to change. Ten major development projects were slated for completion duirng the plan period, and new projects were to be introduced. Closer coordination between industrial sectors was to be carried out for the purpose of balanced development and economic growth without hampering the overall economic stability.

During 1975, Taiwan's total supply of energy was estimated at 17.6 million kiloliters expressed in oil equivalence. Domestic production accounted for about 31% of the total; production by sector was as follows: Coal, 13%; hydroelectric power, 8%; natural gas, 9%; and crude oil, 1%. Imports provided the bulk of the country's primary energy supply and were distributed as follows: Crude oil, 49%; petroleum products, 20%; and coal, less than 1%.

Taiwan's industries consumed 15.8 billion kilowatt-hours of electricity in 1975 including 7.2 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, 1,560; cement, 885; chemical fertilizers, 480; metal products, 443; mining and quarrying, 339; aluminum, 231; basic industrial chemicals, 1,172; and other chemical products, 2,084.

PRODUCTION

By value, coal was the most important mineral commodity mined in Taiwan. Output of bituminous coal increased 7% to 3.1 million tons in 1975. Crude petroleum production was close to 1.4 million 42-gallon barrels, a 2% increase over that of 1974. The principal significance of indigenous oil was as a supplement in the production of refinery products derived from imported crude oil, which overshadowed domestic crude in Taiwan's overall oil supply. Production of natural gas declined slightly to 55.6 billion cubic feet. While output was of little consequence by world standards, natural gas production was important to the domestic economy.

Overall output in iron and steel products showed a general decline owing to decreased demand in both domestic consumption and export shipments. Production of pig iron and crude steel ingot declined 40% and 8%, respectively. Production of primary aluminum metal dropped 10%. The aluminum industry continued to be plagued by higher production costs primarily because of the electrical energy consumed. Output of mine copper decreased substantially, but refined copper metal production decreased 13%.

The production levels for manufactured fertilizer materials were erratic with increases in some items and declines in others. Salt production declined for the fourth consecutive year and was 268,000 tons in 1975 compared with 670,000 tons in 1971. Limestone production, principally for cement manufacture, totaled 9.5 million tons, up 6% over that of 1974. Increased domestic demand for cement absorbed the 10% higher output by the industry.

Table 1.—Taiwan: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Aluminum:			
Alumina, gross weight	70,000	e 70,000	e 70,000
Metal, primary	35,111	31,320	28,111
Sheet	20,822	16,426	17,705
Copper:			
Mine output, metal content e	2,500	2,500	600
Metal, refined secondary	6,649	9,859	8,539
Gold metal, primary ---- troy ounces	r 22,187	22,853	22,110
Iron and steel:			
Iron ore and concentrate	r 25,000	e 25,000	e 25,000
Pig iron	149,954	111,143	66,840
Ferroalloys (ferrosilicon)	13,400	27,180	23,178
Crude steel	507,474	569,563	519,991
Silver metal, primary ---- thousand troy ounces	93	33	6
NONMETALS			
Asbestos	5,308	3,596	1,737
Cement, hydraulic ---- thousand tons	6,096	6,171	6,796
Fertilizer materials, manufactured:			
Urea (46% N) ---- do	180	178	177
Ammonium sulfate (21% N) ---- do	529	482	483
Nitrochalk (20% N) ---- do	23	37	31
Compound fertilizer (20% N, 5% P_2O_5, 10% K_2O) ---- do	216	190	255
Calcium superphosphate (18% P_2O_5) ---- do	201	234	207
Gypsum:			
Precipitated	1,470	1,532	633
Other	3,534	2,443	3,054
Lime ---- thousand tons	176	155	146
Pyrite and pyrrhotite (including cupreous):[1]			
Gross weight	11,216	10,452	14,175
Sulfur content e	4,262	3,972	5,387
Salt, marine ---- thousand tons	r 386	368	268
Sodium and potassium compounds:			
Caustic soda	86,583	89,656	79,891
Soda ash	53,979	59,739	67,274
Stone:			
Dolomite ---- thousand tons	126	135	136
Limestone ---- do	8,756	8,956	9,479
Marble ---- do	r 283	313	532
Sulfur, elemental, native other than Frasch [2]	5,595	3,310	5,476
Talc and related materials, soapstone	r 25,337	13,517	12,050
MINERAL FUELS AND RELATED MATERIALS			
Carbon black e	200	200	200
Coal, bituminous ---- thousand tons	3,327	2,934	3,141
Coke ---- do	218	187	201
Gas, natural:[3]			
Gross production ---- million cubic feet	51,358	56,034	55,603
Marketed ---- do	50,548	52,707	51,683
Natural gas liquids:			
Liquefied petroleum gas from natural gas ---- thousand 42-gallon barrels	687	931	558
Natural gasoline ---- do	201	194	176
Petroleum:			
Crude ---- do	1,055	1,321	1,352
Refinery products:			
Gasoline ---- do	7,905	6,953	7,058
Jet fuel ---- do	7,906	3,750	4,135
Kerosine ---- do	204	152	132
Distillate fuel oil ---- do	11,181	10,367	10,787
Residual fuel oil ---- do	30,319	28,782	26,028
Liquefied petroleum gas ---- do	2,795	1,912	2,839
Asphalt ---- do	1,050	943	1,563
Lubricants ---- do	449	499	534
Other ---- do	1,481	340	406
Fuel and losses ---- do	1,868	2,891	1,298
Total ---- do	65,158	56,589	54,780

e Estimate. p Preliminary. r Revised.
[1] From Chinkuashih only.
[2] Excludes sulfur produced by oil refineries.
[3] Largely processed into natural gas liquids.

TRADE

Taiwan's two-way trade in 1975 was \$11.2 billion, down 11% from the previous year. Exports decreased from \$5.6 billion in 1974 to \$5.3 billion in 1975. Similarly, imports decreased from \$7.0 billion to \$5.9 billion. The largest import items were fuels, minerals, and metal products (\$1.5 billion); machinery, mechanical appliances, and electrical equipment (\$1.4 billion); mineral products (\$0.9 billion); agricultural, animal, and food products (\$0.8 billion); chemicals (\$0.6 billion); and textile materials (\$0.4 billion). By value, shipments from Japan accounted for 32% of Taiwan's total imports, followed by the United States, 24%; West Germany, 7%; Kuwait, 6%; Saudi Arabia, 5%; Indonesia, 3%; and the United Kingdom, 2%. The remaining 21% was contributed by a host of countries.

Textile articles and apparel constituted 35% of total exports, or \$1.9 billion, followed by electrical, optical, and transport equipment, \$1.1 billion; and prepared foodstuffs, \$0.8 billion. Principal export destinations were the United States, Japan, West Germany, Canada, Australia, and others, in that order.

In 1975, the value of mineral and metal products represented 25% of all imports, compared with 6% for these categories in total exports, reflecting Taiwan's reliance on imported raw materials and semimanufactures. During the year, mineral exports were valued at \$337 million, a 35% increase over the prior year's shipments, mainly owing to exports of iron and steel and other metal products. Mineral imports were about \$0.3 million less than in 1974, principally because of the decreased volume of petroleum imports. Table 2 shows the principal mineral categories traded during the last 3 years, and table 3 indicates the tonnage and value of major mineral products imported in 1975.

Table 2.—Value of principal mineral exports and imports by Taiwan
(Million New Taiwan dollars; NT\$38=US\$1.00)

Commodity	1973	1974	1975
EXPORTS			
Iron and steel products	2,218	4,241	4,045
Nonferrous metals	722	895	604
Cement products	r 313	462	277
Glass products	739	951	682
Refined oil products	707	1,015	2,068
IMPORTS			
Iron and steel products	11,333	23,981	15,008
Scrap iron	2,023	3,830	2,020
Iron ore	76	130	101
Nonferrous metals	3,760	r 5,584	4,447
Bauxite	NA	108	106
Copper ore, concentrates, and matte	NA	230	103
Asbestos	111	158	189
Chemical fertilizers	286	1,470	1,764
Phosphate rock	122	556	601
Sulfur	r 108	411	328
Crude oil	3,784	27,257	23,732
Refined petroleum [1]	1,637	5,080	5,849

r Revised. NA Not available.
[1] Mainly fuel oil.
Source: Industry of Free China. Taiwan Economic Statistics. V. 46, No. 3, August 1976, pp. 31–183.

Table 3.—Taiwan: Selected mineral and metal imports, 1975 [1]

Commodity	Quantity (metric tons)	Value (million NT$)	Principal sources (metric tons)
Metal ores:			
Manganese ore	79,371	198,578	India 32,711; Thailand 15,250; Australia 11,852; Malaysia 10,672.
Bauxite	114,433	106,153	Malaysia 105,873.
Copper ore, concentrate, matte	10,000	102,758	Philippines 8,000; Japan 2,000.
Iron ore	143,342	100,971	India 123,175; Malaysia 10,391.
Chromite	3,467	12,955	Philippines 3,055.
Metals:			
Iron and steel:			
Steel products (excluding pig iron and ferroalloys)	NA	14,954,000	Diverse, but heavily from Japan.
Ferroalloys	562	22,434	Japan 480; Republic of Korea 23.
Pig iron	6,213	32,418	All from Japan.
Iron and steel scrap	407,913	2,030,401	United States 340,475; Hong Kong 35,019.
Electrolytic copper, unwrought	16,734	813,016	Japan 5,423; United States 5,302; Canada 2,874.
Platinum, unwrought	5	694,521	Japan 4.
Zinc, unwrought	12,307	395,771	Australia 4,872; Japan 5,310.
Aluminum, unwrought	11,573	380,883	United States 3,810; Ghana 3,041; Japan 1,919.
Tin, unwrought	915	217,681	Malaysia 751; Japan 118.
Lead, unwrought	5,171	87,639	Australia 2,960; Japan 1,755.
Nickel, unwrought	232	36,275	Norway 119; Japan 107.
Nonmetallics:			
Phosphate rock	210,600	599,435	Jordan 123,710; United States 61,031.
Salt	375,475	260,873	Australia 313,939; India 59,845.
Sulfur	96,308	216,805	Canada 89,006.
Asbestos	13,363	188,543	Republic of South Africa 10,934; Canada 1,411.
Gypsum	118,123	90,875	Japan 47,612; Republic of Korea 34,710; Thailand 13,500; Mexico 9,898.
Kaolin	20,857	59,022	United States 9,507; Republic of Korea 5,976; Hong Kong 3,200.
Graphite	5,825	27,685	Republic of Korea 4,440.
Abrasives	1,046	19,288	Mainly from Japan.
Fire clay	1,337	14,148	Japan 1,040; United States 244.
Bentonite	2,241	11,362	United States 1,581; Japan 649.
Steatite	1,646	8,401	Republic of Korea 1,495.
Fuels and fertilizers:			
Crude oil	7,532,457	23,732,386	Kuwait 4,019,137; Saudi Arabia 2,628,677.
Refined petroleum	2,202,185	5,394,038	Kuwait 1,381,502.
Coal	77,315	113,319	Australia 68,044; Republic of South Africa 5,170.
Coke	19,720	51,207	All from Japan.
Chemical fertilizers	331,209	1,759,545	Japan 111,981; United States 99,035; Canada 58,761; Israel 19,627.

NA Not available.
[1] Listed in order of values within categories.

Source: Statistical Department, Inspectorate General of Customs, Republic of China. Monthly Statistics of Trade, Republic of China. V. 1, December 1975.

Table 4.—Taiwan: Exports and reexports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Oxide and hydroxide [2]	687	643	Indonesia 406; Thailand 200.
Metal including alloys, all forms	6,631	7,445	Hong Kong 2,055; Australia 1,502; United States 1,302.
Copper:			
Ore and concentrate	1,038	708	All to Japan.
Metal including alloys, all forms	r 11,833	6,677	Japan 4,214; Hong Kong 2,095.
Gold metal including alloys troy ounces	129	--	
Iron and steel metal:			
Scrap	r 8,374	43,072	Japan 39,027; Thailand 2,673.
Pig iron, ferroalloys, similar materials	6,059	21,639	Japan 14,452; United States 3,975; Philippines 2,150.
Steel, primary forms	r 888	4,977	Japan 2,308; Thailand 1,117; Indonesia 1,065.
Semimanufactures:			
Bars, rods, angles, shapes, sections	135,040	32,136	Saudi Arabia 13,553; Singapore 10,405; Indonesia 7,748.
Universals, plates, sheets	5,479	22,077	Republic of Korea 9,955; United States 3,169; Japan 2,729.
Tubes, pipes, fittings	90,114	126,378	United States 74,541; Saudi Arabia 11,905.
Other	25,171	12,058	Saudi Arabia 3,328; United States 2,099; Indonesia 2,081.
Lead metal including alloys, all forms	84	344	Japan 147; Indonesia 130; Singapore 27.
Magnesium metal including alloys, all forms	134	544	United States 403; Japan 121.
Manganese oxide	--	5	Mainly to Argentina.
Nickel metal including alloys, all forms	492	299	Japan 265; United States 29.
Platinum-group metals and silver:			
Waste and sweepings:			
Silver troy ounces	225	193	All to Hong Kong.
Other do	193	233,768	Mainly to Hong Kong.
Metal including alloys:			
Platinum group do	205,861	707	All to Japan.
Silver do	804	707	Hong Kong 386; United States 321.
Tin metal including alloys, all forms	49	34	Singapore 20; Hong Kong 8; Japan 3.
Titanium oxides kilograms	409	--	
Tungsten (wolfram) do	274	2,282	West Germany 2,000; Netherlands 218.
Zinc:			
Oxide	559	465	Philippines 230; Indonesia 140; Thailand 48.
Metal including alloys, all forms	5	149	Philippines 53; Netherlands 36; Indonesia 13.
Other base metals including alloys, all forms, n.e.s	11	16	United States 15.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	21	32	Japan 20; Philippines 10.
Dust and powder of precious and semiprecious stones kilograms	498	514	All to Hong Kong.
Grinding and polishing wheels and stones	658	855	Japan 352; Philippines 97; Thailand 89.
Asbestos	5	--	
Boric oxide and acid kilograms	725	197,168	Netherlands 197,151.
Cement thousand tons	544	346	Saudi Arabia 87; Indonesia 76; Hong Kong 61.
Chalk	1	--	
Clays and clay products (including all refractory brick) crude clays, n.e.s	1,955	1,680	Thailand 620; Indonesia 409; Philippines 258.
Products:			
Refractory (including nonclay brick)	10,860	10,291	Indonesia 2,636; Philippines 2,197; Ryukyu Islands 1,408.
Nonrefractory	20,386	12,157	Singapore 3,306; Hong Kong 2,009; Malaysia 1,999.
Diamond:			
Gem:			
Not set or strung thousand carats	1,100	2,350	Hong Kong 2,345.
Manufactured do	35	145	United States 125; Switzerland 15.
Industrial do	265	45	All to Hong Kong.

See footnotes at end of table.

Table 4.—Taiwan: Exports and reexports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Diatomite and other infusorial earth	317	2	All to Indonesia.
Feldspar and fluorspar	102	231	Japan 141; Indonesia 50; Thailand 40.
Fertilizer materials:			
Manufactured:			
Nitrogenous	35,160	3,502	All to Philippines.
Phosphatic	12,100	--	
Other including mixed	22,463	4,599	Philippines 4,502.
Ammonia	295	206	Malaysia 176; United States 30.
Graphite, natural	5	44	South Vietnam 25; Hong Kong 13; Argentina 6.
Gypsum and plasters	94	150	Hong Kong 100; Indonesia 50.
Lime	11,817	1,566	Indonesia 355.
Mica, worked, including agglomerated splittings kilograms	772	21	All to United States.
Pigments, mineral, iron oxides, processed	20	20	All to Indonesia.
Precious and semiprecious stones, except diamond:			
Natural thousand carats	70,125	5,182	United States 2,856; Hong Kong 1,128.
Manufactured do	28,440	1,305	United States 836; France 210.
Salt and brine	2,500	400	Mainly to Hong Kong.
Silicon	54	--	
Sodium and potassium compounds, n.e.s	4,056	14,286	Hong Kong 6,349; Republic of South Africa 4,400; Peru 1,800.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	15,721	17,812	Japan 17,508.
Worked	r 205,796	37,752	Japan 36,384.
Dolomite, chiefly refractory grade	1,553	2,602	Indonesia 1,500; Japan 1,002.
Gravel and crushed rock, n.e.s	30,362	124,100	Japan 123,563.
Limestone	512	364	Malaysia 250; Indonesia 64; Singapore 50.
Quartz and quartzite kilograms	69	35	Hong Kong 20; Japan 11; Philippines 3.
Sand, excluding metal bearing	640	213	Japan 86; Malaysia 50; Indonesia 21.
Sulfur:			
Elemental, all forms	156	21	South Vietnam 20.
Sulfuric acid and oleum	32,356	31,353	All to Japan.
Talc, steatite, soapstone, pyrophyllite	429	538	Singapore 250; Thailand 203; Hong Kong 60.
Other nonmetals, n.e.s.:			
Crude	199	283	Singapore 108; Indonesia 81; Hong Kong 50.
Slag, dross, and similar waste, not metal bearing	228	3,481	Singapore 2,810; Thailand 600.
Oxides and hydroxides of magnesium, strontium, barium	19	37	Singapore 13; Indonesia 12; Nigeria 10.
Building materials of asphalt, asbestos and fiber, and unfired nonmetals, n.e.s	2,404	1,113	Japan 604; Hong Kong 273.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	179	292	Thailand 148; Hong Kong 106; Singapore 26.
Coal and coke including briquets	7,921	3,147	Thailand 2,075; Philippines 300.
Hydrogen and other rare gases	7	--	
Petroleum:			
Crude thousand 42-gallon barrels	1	--	
Refinery products:[3]			
Gasoline:			
Aviation do	26	--	
Motor do	1,702	233	NA.
Kerosine do	107	--	
Jet fuel do	4,576	61	NA.
Distillate fuel oil do	2,836	519	NA.
Residual fuel oil do	521	--	
Other do	62	139	NA.
Total do	9,830	952	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	169,050	126,679	Japan 103,379; United States 15,745.

r Revised. NA Not available.

[1] Unless otherwise specified, compiled from official Taiwan trade returns, Monthly Statistics of Trade, Republic of China, May 1975. V. I.

[2] Total includes 7 metric tons of artificial corundum in 1973 and 18 metric tons of artificial corundum in 1974.

[3] U.S. Bureau of Mines. International Petroleum Annual 1974. March 1976.

Table 5.—Taiwan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Bauxite and concentrate ---- thousand tons --	9	106
Oxide and hydroxide ----	14,797	25,691
Metal including alloys:		
Scrap ----	13,225	8,148
Unwrought ----	14,672	18,338
Semimanufactures ----	2,640	5,015
Arsenic:		
Natural sulfides ----	19	16
Trioxide, pentoxide, acids ----	468	313
Chromium:		
Chromite ----	26,722	21,173
Oxide and hydroxide ----	871	911
Cobalt oxide and hydroxide ----	32	18
Columbium and tantalum, tantalum metal including alloys, all forms kilograms --	51	6
Copper:		
Ore and concentrate ----	--	12,743
Matte ----	4	18
Copper sulfate ----	66	122
Metal including alloys, all forms ----	r 30,647	34,077
Gold metal, unworked or partly worked ---- thousand troy ounces --	250	1
Iron and steel:		
Ore and concentrate ----	132,029	143,862
Roasted pyrite ----	330	5,000
Metal:		
Scrap ----	715,761	785,874
Pig iron, ferroalloys, similar materials ----	71,677	67,079
Steel, primary forms ----	58,918	70,525
Semimanufactures ---- thousand tons --	1,089	1,620
Lead:		
Oxides ----	1,738	1,127
Metal including alloys:		
Scrap ----	5,372	3,350
Unwrought and semimanufactures ----	r 6,671	4,811
Magnesium metal including alloys, all forms ----	231	757
Manganese:		
Ore and concentrate ----	10,788	28,885
Oxides ----	2,311	2,875
Metal ----	17	67
Mercury ---- 76-pound flasks --	1,686	406
Molybdenum metal including alloys, all forms ----	11	217
Nickel metal including alloys, all forms ----	1,855	1,729
Platinum-group metals and silver metal including alloys:		
Platinum group ---- thousand troy ounces --	10	28
Silver ---- do ----	1,073	2,447
Tin metal including alloys, all forms ----	r 255	1,221
Titanium oxides ----	8,122	7,469
Tungsten metal including alloys, all forms----	13	7
Zinc:		
Oxide and peroxide ----	381	436
Metal including alloys, all forms ----	r 30,210	24,904
Other:		
Ore and concentrate:		
Of molybdenum, tantalum, titanium, vanadium, zirconium ----	3,524	11,446
Of base metals, not elsewhere specified ----	1,821	1,121
Ash and residue containing nonferrous metals ----	1,758	7,330
Oxides, hydroxides, peroxides of metals, n.e.s ----	1,235	392
Metals including alloys, all forms:		
Alkali, alkaline earth, rare-earth metals ----	r 52	31
Pyrophoric alloys ---- kilograms --	900	1,481
Base metals including alloys, all forms, n.e.s ----	164	139
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc ----	4,851	3,714
Dust and powder of precious and semiprecious stones ----	1	(1)
Grinding and polishing wheels and stones ----	r 384	562
Asbestos ----	13,096	16,348
Barite and witherite ----	1,050	160
Boron materials:		
Crude natural borates ----	50	238
Oxide and acid ----	566	533
Bromine ---- kilograms --	1,709	72
Cement ----	3,086	4,647
Chalk ---- kilograms --	991	930

See footnotes at end of table.

Table 5.—Taiwan: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s.:		
Bentonite	2,851	3,551
Fire clay	3,445	3,980
Kaolin	27,913	30,219
Other	35,901	48,718
Products:		
Refractory (including nonclay bricks)	5,090	7,359
Nonrefractory	336	1,051
Cryolite and chiolite	6	1
Diamond:		
Gem, not set or strung thousand carats	105	225
Industrial:		
Natural do	r 1,080	3,950
Manufactured do	200	175
Diatomite and other infusorial earth	656	646
Feldspar and fluorspar	14,989	20,153
Fertilizer materials:		
Crude, phosphatic	139,547	251,340
Manufactured:		
Nitrogenous	17,562	123,389
Potassic	127,685	394,803
Other, including mixed	66,577	11,655
Ammonia	5,185	28
Graphite, natural	4,197	7,471
Gypsum and plasters	126,751	86,933
Iodine	10	4
Lime	32	38
Mica, all forms	459	735
Pigments, mineral:		
Natural, crude	2	24
Iron oxides, processed	2,782	2,493
Precious and semiprecious stones, except diamond:		
Natural thousand carats	r 86,680	432,970
Manufactured do	r 17,930	61,205
Salt and brine	66,161	509,329
Sodium and potassium compounds, n.e.s.:		
Caustic soda	r 15,062	7,517
Caustic potash, sodic and potassic peroxides	371	242
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	310	448
Worked	1,101	2,888
Dolomite, chiefly refractory grade	305	1,626
Gravel and crushed rock	235	280
Quartz and quartzite	923	3,182
Sand, excluding metal bearing	435	1,258
Sulfur:		
Elemental:		
Other than colloidal	121,917	155,906
Colloidal	86,858	228,091
Sulfur dioxide	10	10
Sulfuric acid, oleum	26	17
Talc, steatite, soapstone, pyrophyllite	2,300	2,454
Other nonmetals, n.e.s.:		
Crude	50,374	63,874
Slag, dross, and similar waste, not metal bearing	8,594	24,195
Oxides and hydroxides of magnesium, strontium, barium	6,282	10,884
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	107	130
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	95	109
Carbon black and gas carbon:		
Carbon black	13,394	12,354
Gas carbon	13	11
Coal, all grades, including briquets	r 59,146	541,870
Coke and semicoke	80,320	90,200
Hydrogen, rare gases, other nonmetals	498	635
Peat, including peat briquets and litter	20	--
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	64,852	56,111
Refinery products:		
Residual fuel oil do	10,916	14,244
Lubricants (including grease) do	12	360
Other do	1,231	2,113
Total do	12,159	16,717
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	48	9,941

r Revised.

1 Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—Taiwan Aluminum Corp. (TALCO) remained the sole producer of primary aluminum in 1975. The capacities of TALCO's alumina plant and smelter facilities at Kaosiung were rated a 76,000 tons per year alumina and 38,000 tons per year aluminum. During the year, 114,433 tons of bauxite was imported; 105,873 tons was shipped from Malaysia, and the remainder was from Hong Kong, India, Japan, and Singapore. In 1975, Taiwan produced 70,000 tons of alumina, 28,111 tons of aluminum ingot (down 3,209 tons from 1974), and about 3,000 tons of secondary aluminum metal. Manufacture of aluminum sheet was 17,705 tons; foil, 1,959 tons; and miscellaneous products, 28,741 tons. TALCO produced all of the primary aluminum ingot, the bulk of the sheet and foil, and a minor portion of the aluminum manufactures. China Wire & Cable Co. and Walsin Electric Wire & Cable Co. accounted for all of the secondary recovery of aluminum and the bulk of the output of extrusions, castings, and semimanufactures.

Under technical assistance from Pechiney Ugine Kuhlmann of France, TALCO was completing the expansion of its alumina plant from 76,000 to 140,000 tons per year by 1976 at an estimated cost of $53 million. Smelter capacity was likewise being expanded from 38,000 to 70,000 tons per year, at a cost of about $22 million. The target year of completion for this phase of the project was 1979.

Copper.—Taiwan Metal Mining Corp. (TMMC), a Government-owned company, controls most of the copper industry in Taiwan. Output of mine copper remained at the 2,500-ton-per-year level and was chiefly from the Chinkwashih auriferous deposit in northern Taiwan. A small amount was reportedly produced from the Tungshan cuperiferous pyrite deposit at Ilan-hsien. Imports of copper raw materials (mainly concentrate and cement copper) in 1975 totaled 10,000 tons, of which 8,000 tons were received from the Philippines and the remainder from Japan. Total production of refined metal by TMMC's 10,000-ton-per-year smelter at Keelung was 8,539 tons in 1975, down 1,320 tons from 1974. Plans were being considered to expand smelter capacity eventually to 30,000 tons per year. Feasibility studies to erect a 50,000-ton-per-year copper smelter at Taichung to use Indonesian ore were being considered. In addition to copper raw materials, Taiwan imported 16,734 tons of refined copper and around 10,000 tons of copper products to supplement domestic output as feed materials for its rolling and fabrication facilities.

Iron and Steel.—Iron ore production has been insignificant in Taiwan, averaging about 25,000 tons per year. The limited output came mainly from magnetite occurrences distributed along the northern coast between Tanshui and Wanli. Imports of iron ore and concentrates totaled 143,342 tons in 1975 and were chiefly from India (123,175 tons), Malaysia (10,291 tons), and four other countries (9,876 tons). Imports of pig iron were only 6,213 tons, wholly from Japan. Receipts of iron and steel scrap, chiefly from the United States, were 407,913 tons. In addition, 1,264,000 tons of ships and vessels were imported for dismantling and production of scrap metal.

Production of pig iron was 66,840 tons, down 44,303 tons from 1974 output. Production of cast iron pipe and iron wire during the year was 31,543 tons and 30,944 tons, respectively. Production of ferrosilicon was 23,178 tons, 15% less than in 1974. Manufacture of steel products follows, in tons: Ingots, 519,991; castings, 27,600; rod and bar, 665,141; sections, 291,277; tubes and pipes, 108,265; and ball, 1,474.

China Iron and Steel Corp., Ltd. (China Steel) continued construction of its integrated steelworks at Kaohsiung. Technical assistance was being provided by USS Engineers and Consultants, Inc., a subsidiary of United States Steel Corp. Upon completion of the first phase of the project in 1978, initial capacity will be 1.35 million tons of steel per year. The second phase of construction would roughly double the capacity by the end of 1982. The ultimate planned capacity was 6 million tons per year; however, no date has been set for attaining this output. This facility is the most expensive of Taiwan's 10 major development projects in progress; estimated cost for construction was $931 million and cost may exceed

$1 billion by completion. Cost of the second-phase expansion was roughly estimated at $700 million, depending on the product mix desired. The new facilities would include additional coke ovens, a blast furnace, and rolling mill.

The initial capitalization of China Steel was $240 million, and the additional financing was to be provided from domestic and foreign loans. The original plan called for 55% private ownership with the remainder resting with the Government. China Steel failed to attract the private equity investment required, and the Taiwan Government has assumed full responsibility for the financing. Japan, the United Kingdom, France, West Germany, and the United States have provided loans for purchasing equipment. In addition, foreign banks have reportedly provided about two-thirds of the financing for the steel mill.

While China Steel would be a state enterprise, it would be operated as a private undertaking with purchases, employment, and related procedures not subject to Government review. However, the annual budget for the company would require approval by the Legislative and Executive Yuan. The first budget submission for Government review was scheduled for 1976.

Other Metals.—In 1975, Taiwan produced 22,110 troy ounces of gold and 5,990 troy ounces of silver. Both gold and silver were recovered as byproducts from copper refinishing at Chinkwashih. Additional gold was derived from imported copper materials.

Taiwan does not produce any primary zinc, lead, tin, or nickel but consumes sizable tonnages of these metals. In 1975, 12,307 tons of unwrought zinc valued at NT$396 million were imported from Australia (4,872 tons), Japan (5,310 tons), and other countries (1,125 tons). In addition, 1,425 tons of scrap zinc was imported, mainly from the United States. Imports of unwrought lead totaled 5,171 tons valued at NT$88 million, most of which were from Australia (2,960 tons) and Japan (1,755 tons). Scrap lead imports were 4,474 tons valued at NT$218, with Malaysia providing 82% of the total shipments. Nickel imports totaled only 232 tons (compared with 1,601 tons in 1974) valued at NT$36 million, with Norway and Japan providing about one-third each of the country's receipts. During 1975, Taiwan produced 26,325 tons of galvanized sheet, 37,624 tons of galvanized wire, and 11,055 tons of tin plate.

NONMETALS

Cement.—Total manufacture of cement totaled 6.7 million tons, up 625,000 tons from the country's output in 1974. Exports continued to decline, going from 346,000 tons in 1974 to 134,253 tons in 1975. Principal destinations for export shipments of cement were Singapore, Saudi Arabia, and Hong Kong, in that order. While prospects for long-term exports were diminishing, domestic demand continued to rise due to consumption resulting from the construction on Taiwan's 10 major development projects. The total industry capacity was around 9.6 million tons per year and would reach 11 million tons by 1976.

There were 13 operating cement plants in Taiwan—six in the south, five in the north, and two in the east. Most of the cement plants have their own limestone quarries, and only the small plants purchased limestone raw material from quarries operated by others. While Taiwan has abundant limestone, the western reserves have been extensively quarried. The eastern reserves are huge, and mining of these resources has been limited owing to poor transport accessibility. The industry needs around 100,000 tons of gypsum for cement production. Domestic production of gypsum in 1975 was only 3,054 tons. The bulk of the gypsum supply was from imports, which totaled 111,403 tons, principally from Japan, the Republic of Korea, Thailand, and Mexico, in that order.

Taiwan Cement Corp. (TCC) was the largest producer on the island with four plants and a combined annual capacity of 3.8 million tons. Asia Cement Corp. ranks second with a total annual capacity of 2.5 million tons. Ten other companies, each with a plant, accounted for the remaining 3.3 million tons of the country's cement capacity.

Fertilizer Materials.—In 1975, Taiwan produced 482,916 tons of ammonium sulfate, 177,111 tons of urea, 135,330 tons of anyhydrous ammonium, 207,200 tons of calcium superphosphate, and 255,111 tons of compound fertilizers. Taiwan has no potash resources and little apatite. During 1975, Taiwan imported 210,600 tons of phosphate rock (251,340 tons in 1974), mainly from Jordan and the United States. Imports of potassic, mineral, and chemical fertilizers totaled 198,894 tons and were principally from the United States, Canada, Israel, and West Germany, in that order.

Taiwan Fertilizer Co. (TFC) continued the construction of a facility at Miaoli which would produce 186,000 tons per year of urea and 300,000 tons per year of liquid ammonia from petroleum refinery offgas. The Miaoli fertilizer plants were expected to be completed in 1977. TFC was also constructing a 10,000-ton-per-year melamine plant at Hsinchu, also scheduled for completion in 1977. By yearend 1975, the China Phosphates Industries Corp., a Government enterprise, was nearing the completion of its fertilizer facility at Kaohsiung which would 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 byproduct gypsum.

Salt.—The total production of salt was by Taiwan Salt Works, a Government monopoly. Salt output declined from 362,809 tons in 1974 to 283,000 tons in 1975. Salt consumption declined owing to decreased demand by the soda-chlorine industry. Imports of salt totaled 375,475 tons (509,329 tons in 1974) of which the principal suppliers were Australia, 313,929 tons, and India, 59,845 tons. During the year, production of caustic soda was 79,891 tons; "liquid soda," 190,892 tons; and soda ash, 67,274 tons.

Stone.—*Limestone.*—Important limestone deposits of commercial value occur throughout the island, and the large quarries are usually operated by cement companies. Limestone production in 1975 was 9,478,884 tons, most of which was used in the manufacture of cement. The sugar refining industry was the second major consumer of limestone in Taiwan. Limestone was also domestically used as a source of lime and in the production of carbide cyanamide fertilizer.

Marble.—Taiwan's marble reserves are extensive and located on the east coast near Hualien. Output of marble reached 531,746 cubic meters, compared with 312,593 cubic meters in 1974. Exports of marble were valued at NT$11.3 million; in 1975, 90% of the marble exported was shipped to Japan.

Other Nonmetals.—Taiwan's production of elemental sulfur was 5,476 tons compared with 96,308 tons of imports in 1975. The quantity of sulfur recovered from petroleum refining was not reported but is probably large. Pyrite production, mainly from the Chinkwashih copper mine, was 14,176 tons, or close to one half the output in 1972. Talc product declined to 12,050 tons, about one-half of the 1972 level of output. Domestic production of asbestos was only 1,737 tons, and Taiwan requirements were met by imports (13,363 tons), primarily from the Republic of South Africa. Close to 136,000 tons of dolomite was produced in 1975. Clays were both exported and imported. Taiwan relied totally on imports for abrasives, fluorspar, graphite, and mica.

Taiwan Alkali Corp. completed the first phase of the construction of a 30,000-ton-per-year titania plant at Kaohsiung. The second (and final) phase of construction was scheduled for completion in 1976. This plant uses a process developed by the Benilite Corp. of America whereby ilmenite ore is leached and beneficiated with hydrochloric acid which yields a suitable feedstock for chlorination to produce titanium dioxide pigment. Commercial production of titania was expected to begin in late 1976.

MINERAL FUELS

Coal.—Most of the coal deposits are found in northern Taiwan. The coalbeds may reach 1 meter in thickness, but the average thickness of the workable beds ranges from 35 to 60 centimeters. The coal is mostly of the subbituminous to high-volatile bituminous type, and only about 20% has coking property. Since 1969, coal production in Taiwan has gradually decreased. Production in 1975 was 3.1 million tons, an increase of 7% over that of 1974. However, the outlook for increasing coal production was dim, and coal production could be expected to stabilize at 3 million to 3.5 million tons per year. To guard against a possible fuel shortage, 541,830 tons of coal was imported in 1974. In 1975, receipts of coal were only 77,315 tons, of which nearly 90% was from Australia. The wholesale price for domestic coal averaged $32.61 per ton during 1975, which remained low compared with prices of some foreign coals. Most of the country's requirements for coking coal were met by imports. In 1975, 19,720 tons was imported, all from Japan.

Natural Gas.—Natural gas was the most important mineral fuel produced in Taiwan. Production was largely from the Chinshui and the Tiehchenshan Fields in northern Taiwan and fields in the north-central region. Output of natural gas in 1975 was 55,603 million cubic feet compared with 56,034 million cubic feet in 1974. During 1975, the Continental Oil Co. (CONOCO), under a drilling contract with the Government-owned Chinese Petroleum Corp. (CPC) made a gas strike off the coast of southern Taiwan. CONOCO's F3 well hit gas at 4,000 meters and was capped off. Gas was found at CONOCO's F1 well a year earlier. This well was about 60 miles southwest of Taiwan in 400 feet of water. Preliminary studies indicated that the well had a capability of 25 million cubic feet per day of gas and 250 barrels per day of condensate.

Petroleum.—Output of indigenous crude oil was 1.352 million barrels, a slight increase over crude production in 1974. Domestic production equaled only about 2% of crude oil imports in 1975. During the year, Taiwan imported 7.532 million tons of crude oil, of which 4.019 million tons was from Kuwait and 2.629 million tons from Saudi Arabia. Imports of crude oil in 1975 were valued at about NT$23.7 billion, and refined oil imports at NT$5.4 billion.

Taiwan's economy is greatly affected by oil. The country derived 70% of its energy in 1975 from petroleum. Two of its most important industries—textiles and plastics—depend on oil refining for most of the feedstock materials. CPC's total refinery capacity, embodied mainly at Kaohsiung, was 334,500 barrels per day at yearend 1975, compared with 230,000 barrels per day at yearend 1974. Domestic crude oil reserves were estimated at about 24.9 million barrels. The country also had about 5,000 barrels per day of condensate production and about 15,000 million barrels of condensate reserves.

The production of oil has increased in recent years, resulting from increased production of condensate associated with natural gas output. Offshore exploration for petroleum resources on the Continental Shelf has been actively conducted either by the Government or in collaboration with international enterprises. Foreign companies participating with CPC in offshore exploration include CONOCO, American Oil Co. (AMOCO), Oceanic Exploration, Clinton International, Ltd., Texfel Pacific Corp., Superior Oil Co., and Cemoro Petroleum.

Only a handful of wildcat wells had been drilled offshore, and all except two were dry. The first strike was CONOCO's F1 well, which was for natural gas with a minor associated capability of condensate. The second strike was by CPC, where oil was found 10 miles offshore Lukang in the Taiwan Straits in a 12,000-foot well in 50 feet of water.

The Mineral Industry of Thailand

By Gordon L. Kinney [1]

The Thai economy experienced major setbacks in 1975 as the rate of economic growth slowed, export prices of Thailand's main commodities fell, and the investment climate, affected by Thai Government policy decisions and political developments in neighboring countries, reached a low.[2]

The mining industry recorded its worst performance in more than 10 years, reflecting in part the general economic downturn and a decline in capital investment.[3] However, a main factor was the Government's cancellation of the leases held by Thailand Exploration and Mining Co., Ltd. (TEMCO), in March 1975. TEMCO was the country's largest single tin producer, operating three dredges off the coast of Phangnga Province. Originally a subsidiary of Union Carbide Corp., it was jointly owned after 1970 by Union Carbide and Billiton Co. of Royal Dutch Petroleum; shortly, it is expected to be totally transferred to Billiton, who will retain ownership of the dredges.

The reason cited for withdrawal of the TEMCO leases was that the leases had been obtained by methods that violated the country's Minerals Act. However, students, activists, and some provincial authorities had protested against a foreign company profiting from the nation's richest mineral deposits, and public pressure may have been a factor. The situation made potential mining investors hesitant. Continued lack of a predictable Government policy toward the mining industry hampered plans for capital expansion and new ventures.

Although the TEMCO lease withdrawal was the most significant event of the year to directly affect the industry, of possibly greater long-term importance was the confirmation of commercial amounts of natural gas in offshore waters. As of yearend, Union Oil Co. and the Thai Government were still negotiating a long-term pricing policy for the gas. Construction of production and transport facilities was expected to begin soon after a contract is ratified.

Continued delineation of the potash deposits reported last year showed very large tonnages. Further detailed drilling of the deposits is dependent on availability of Government funding.

Farming, which employs about 70% of the labor force, accounted for about 30% of the gross domestic product (GDP). Only modest increases in output in the important agricultural sector were recorded. The gross national product (GNP) for 1975 was reported to be $14.8 billion,[4] a growth of over 6% for the year. The mining industry contributed 1.2% of the GNP compared with 1.4% in 1974. Total value of mining output was $170 million in 1975, down 27% from that of 1974. Total value of mineral exports of $158 million in 1975 was, correspondingly, down about 26%.

Mining and quarrying employed only about 50,000 workers, or 0.33% of the total work force of 14 million. The export of minerals contributed nearly 7% of the total value of all Thai exports.

The inflow of direct foreign investment into all sectors of the economy picked up after a severe plunge in April and May 1975, following the change of Government in Phnom Penh and Saigon. In the first 8 months of 1975, foreign investment reached a total of $112.9 million compared with

[1] Physical scientist, International Data and Analysis.

[2] Far Eastern Economic Review (Hong Kong). Asia Yearbook. 1976, pp. 306–308.

[3] Mining Journal (London). Mining Annual Review. June 1976, 560 pp.

[4] Where necessary, values have been converted from Thai baht (B) to U.S. dollars at the rate of B20.379=US$1.00.

$114.2 million during the same period in 1974. Although little of this 1975 investment went into mining, outflow in the form of loan repayments, dividends, and profits increased from $27.7 million through August 1974 to $59.6 million in the same period in 1975.

PRODUCTION

Production of each of Thailand's four most valuable minerals, tin, tungsten, fluorite, and antimony (in that order), dropped substantially. Tin output declined about 19% in 1975. Tungsten production was off nearly 20%, owing mainly to unrest in some of the mining areas and partly to depletion of some of the more easily mined surface deposits. Lower demand and prices for fluorite caused an overall drop of 33% in mine production from last year's record level.[5]

[5] U.S. Embassy, Bangkok, Thailand. State Department Airgram A-140. Industrial Outlook Report: Minerals. June 16, 1976, 15 pp.

Table 1.—Thailand: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Antimony:			
Ore:			
Gross weight	8,033	9,966	7,372
Metal content	3,414	4,236	3,133
Smelter	199	376	336
Chromium, chromite, gross weight	--	--	200
Columbium and tantalum, ore and concentrate, gross weight:			
Columbite	20	10	7
Tantalite	4	82	103
Copper, mine output, metal content	1	2	--
Iron and steel:			
Iron ore, 55% iron, gross weight	36,309	36,303	32,476
Pig iron	r 14,436	17,011	12,626
Ferroalloys:			
Ferrosilicon	--	1,059	393
Ferromanganese	--	1,770	831
Steel, primary forms:			
Ingots	e 190,000	220,000	236,224
Billets e	102,000	r 150,000	240,000
Semimanufactures (selected):			
Bars	NA	NA	67,756
Galvanized iron sheets	86,056	72,118	83,146
Tinned plates	23,062	27,110	20,889
Lead:			
Mine output, metal content	3,704	1,543	1,533
Metal, unwrought ingot	1,579	1,221	944
Manganese ore:			
Battery grade and chemical grade, 75% MnO_2	r 11,353	8,846	3,577
Metallurgical grade, 46% to 50% MnO_2	24,950	20,120	20,493
Chemical grade, over 75% MnO_2	15	--	844
Total	36,318	28,966	24,914
Monazite, gross weight	318	441	367
Tin:			
Mine output, metal content	20,921	20,339	16,406
Smelter:			
Primary	22,927	19,827	16,630
Secondary	30	9	13
Tungsten concentrate:			
Gross weight	r 5,049	4,286	3,441
Metal content	r 2,403	2,040	1,637
Yttrium ores and concentrates, xenotime	26	--	--
Zinc:			
Mine output, metal content	66	78,617	7,700
Metal, unwrought ingot	183	66	66
Zircon, gross weight	402	2,002	383
NONMETALS			
Asbestos	83	--	--
Barite	111,930	200,917	258,387
Cement, hydraulic ... thousand tons	r 3,706	3,923	3,959
Clays:			
Ball clay	NA	28,000	NA
Kaolin	18,995	60,878	15,782
Feldspar	4,510	6,998	13,025

See footnotes at end of table.

Table 1.—Thailand: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Fertilizer materials:			
Crude, phosphatic	810	5,603	5,805
Manufactured	24,396	30,584	153,273
Fluorspar:			
Crude mine production:			
High grade	r 342,146	340,760	174,918
Low grade	55,924	87,931	111,231
Total	r 398,070	428,691	286,149
Salable product:			
Acid grade (beneficiated low grade)	r 34,953	54,957	69,519
Metallurgical grade	r 342,146	340,760	174,918
Total	r 377,099	395,717	244,437
Graphite	--	--	30
Gypsum	236,265	311,795	255,242
Salt, rock thousand tons	160	160	160
Sand, silica	51,450	59,640	34,310
Stone:			
Calcite	NA	50	--
Dolomite	NA	400	20
Limestone thousand tons	NA	1,836	NA
Marble	NA	3,645	NA
Marl (used for cement) thousand tons	246	227	468
Quartz, not further described	13,837	10,830	11,330
Shale	NA	615,200	NA
Sulfur, sulfuric acid	47,103	46,940	e 1 45,000
Talc and related materials:			
Pyrophyllite	9,550	1,640	10,300
Talc	75	158	347
MINERAL FUELS AND RELATED MATERIALS			
Coal, lignite thousand tons	361	485	462
Petroleum:			
Crude thousand 42-gallon barrels	45	42	e 42
Refinery products:			
Gasoline do	9,008	8,769	6,004
Jet fuel do	4,283	4,337	4,710
Kerosine do	1,515	1,766	842
Distillate fuel oil do	13,753	12,305	13,596
Residual fuel oil do	19,470	17,438	17,512
Other:			
Liquefied petroleum gas do	2,539	2,428	2,152
Naphtha do	2,466	2,062	2,367
Asphalt do	7,742	498	589
Unspecified do	5,727	7,924	5,265
Refinery fuel and losses do	NA	465	403
Total do	66,503	57,992	53,440

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Estimate based on 6 months data.

TRADE

Total trade in 1975 amounted to $5.7 billion, with $2.4 billion in exports and $3.3 billion in imports, resulting in a trade deficit of about $900 million. Japan remained the main market for Thai exports, taking 26% of the total; Hong Kong and the United States followed with 13% and 10%, respectively.

Agricultural exports generally account for more than 60% of foreign-exchange earnings. (Thailand was the world's leading exporter of rice and third-largest exporter of rubber.) Mineral exports represented only 6.8% of Thailand's total exports in 1975. Tin exports in that year were valued at $112 million, or about 70% of total mineral exports.

Major imports were machinery valued at $1.2 billion, mineral fuels and lubricants worth $710 million, and iron and steel worth about $250 million, which accounted for 36%, 22%, and 8%, respectively, of the total imports for 1975. Imports of nonferrous metals and fertilizers were also sizable. Thus, the aggregate of all mineral imports was equivalent to 6% to 7% of the GNP for 1975.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Oxides and hydroxides	--	20
Metal including alloys:		
Unwrought	--	1,692
Semimanufactures	25	126
Antimony:		
Ore and concentrate	6,360	6,792
Metal including alloys, unwrought	45	92
Columbium and tantalum, ore and concentrate	44	40
Copper metal including alloys, all forms	161	377
Gold metal, unworked, or partly worked ..... troy ounces	--	148
Iron and steel metal:		
Pig iron, ferroalloys, and similar materials	r 10,159	10,155
Steel, primary forms	7	--
Semimanufactures	r 25,709	24,457
Lead:		
Ore and concentrate	1,520	170
Metal including alloys:		
Unwrought	300	715
Semimanufactures	345	3
Manganese:		
Ore and concentrate	17,240	18,780
Oxides	40	--
Tin:		
Metal including alloys, unwrought	22,313	20,768
Slag [2]	2,834	NA
Silver metal including alloys, all forms ..... troy ounces	--	6,430
Titanium oxides	4	39
Tungsten:		
Ore and concentrate	[2] 4,756	4,929
Metal including alloys, unwrought	[2] 42	--
Zinc:		
Ore and concentrate	--	74,604
Oxide	2	141
Metal, including alloys:		
Unwrought	--	295
Semimanufactures	559	628
Zirconium ore and concentrate	--	100
Other:		
Ores and concentrates	124,339	114,500
Ash and residue containing nonferrous metals	43	--
NONMETALS		
Abrasives, grinding and polishing wheels and stones	1	--
Asbestos	--	1,928
Barite	[2] 94,438	67,637
Cement	r 820,256	919,536
Clays and clay products:		
Crude clays, n.e.s.:		
Fuller's earth, dinas, and chamotte	1,000	31
Kaolin	1,331	2,736
Products:		
Refractory	311	418
Nonrefractory	1,121	1,560
Diamond, gem, not set or strung ..... carats	698	--
Feldspar, leucite, nepheline, nepheline syenite	1,800	1,355
Fertilizer materials:		
Crude and manufactured:		
Nitrogenous	44	--
Potassic	574	957
Other and mixed	633	12
Ammonia, anhydrous	61	32
Fluorspar	275,508	305,541
Gypsum	41,726	117,672
Magnesite	260	--
Precious and semiprecious stones, except diamond:		
Natural:		
Precious ..... thousand carats	5,981	4,856
Semiprecious ..... kilograms	75,738	141,143
Manufactured ..... do	136	117
Salt	r 108,874	125,956
Stone, sand and gravel:		
Dimension stone, crude and partly worked, unspecified	360	102
Gravel and crushed rock	1,037	73
Limestone	31	45
Quartz and quartzite	4,001	10,511
Other, slag, dross and similar waste, not metal bearing n.e.s	6,105	9,841

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1973	1974
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	914	1,041
Carbon black	10	1
Coal briquets	1	31
Petroleum refinery products: [3]		
Gasoline, motor and aviation ---thousand 42-gallon barrels--	1,091	526
Kerosine ---do---	246	356
Jet fuel ---do---	337	70
Distillate fuel oil ---do---	775	220
Residual fuel oil ---do---	1,422	7
Lubricants ---do---	15	14
Mineral jelly and waxes ---do---	--	208
Other:		
Liquefied petroleum gas ---do---	355	201
Unspecified ---do---	363	10
Mineral tar and other coal–, petroluem–, or gas–derived crude chemicals	--	8

r Revised. NA Not available.

[1] Source unless otherwise specified: Department of Customs, Bangkok, Thailand. Foreign Trade Statistics of Thailand December 1973 and December 1974.

[2] Source: Department of Mineral Resources, Bangkok, Thailand. Mineral Production, Exports and Domestic Consumption of Thailand 1964–1973.

[3] Includes bunkers.

Table 3.—Thailand: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Bauxite and concentrate	3,065	1,795
Oxide and hydroxide	10,515	11,592
Metal including alloys:		
Scrap	829	457
Unwrought	21,850	23,784
Semimanufactures	r 4,975	6,344
Antimony:		
Ore and concentrate	25	132
Metal including alloys, all forms	10	--
Arsenic trioxide, pentoxide, acids	95	124
Cadmium metal including alloys, all forms	(1)	1
Chromium: Oxide and hydroxide	246	302
Cobalt:		
Oxide and hydroxide	224	16
Metal including alloys, all forms	1	3
Copper:		
Ore and concentrate	20	--
Matte	478	127
Copper sulfate	131	266
Metal including alloys:		
Scrap	1,638	712
Unwrought:		
Blister copper and other unrefined copper	430	267
Refined, unalloyed	242	277
Master alloys	2	1
Semimanufactures	5,141	6,604
Gold metal, unworked or partly worked ---troy ounces--	r 9,408	781
Iron and steel:		
Metal:		
Scrap	365,891	255,920
Pig iron, ferroalloys, similar materials	4,460	7,071
Sponge iron, powder, shot	419	260
Steel ingots and other primary forms	r 2,130	18,814
Semimanufactures	686,340	654,982
Lead:		
Oxide	331	552
Metal including alloys:		
Scrap	319	45
Unwrought	6,961	5,396
Semimanufacturers	982	288
Magnesium metal including alloys:		
Ore and concentrate	20	--
Oxide	--	25

See footnotes at end of table.

Table 3.—Thailand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS—Continued		
Magnesium metal including alloys—Continued		
Scrap	(1)	(1)
Unwrought	5	6
Semimanufactures	398	16
Manganese:		
Ore and concentrate	334	8,292
Oxides	545	383
Mercury ---76-pound flasks	303	9
Molybdenum metal including alloys, all forms	1	(1)
Nickel:		
Matte, speiss, similar materials	7	7
Metal including alloys:		
Scrap	--	1
Unwrought	222	90
Semimanufactures	311	495
Platinum-group metals including alloys, all forms ---troy ounces	135,483	32
Silver metal including alloys ---do	272,541	70,732
Tin:		
Oxides	1	(1)
Unwrought	3	1
Semimanufactures	1	17
Titanium:		
Ore and concentrate	1,031	591
Oxide	r 3,314	2,248
Tungsten metal including alloys, all forms	11	2
Zinc:		
Oxide	2,012	685
Metal including alloys:		
Scrap	789	162
Powder and dust	6	28
Unwrought	22,070	23,286
Semimanufactures	r 1,109	1,342
Zirconium ore and concentrate	1	--
Other:		
Ore and concentrate of base metals, n.e.s	1,308	5,973
Metals including alloys, all forms:		
Alkali, alkaline earth, rare-earth metals	3	(1)
Pyrophoric alloys	39	56
Base metals including alloys, all forms, n.e.s	1	6
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	1,867	1,888
Dust and powder of precious and semiprecious stones ---kilograms	31	2
Grinding and polishing wheels and stones	1,317	1,052
Asbestos	36,310	41,802
Barite and witherite	6	14
Bromine:		
Elemental ---kilograms	31,438	1
Compounds, n.e.s ---do	47,266	51,633
Cement	35	538
Chalk	446	509
Clays and clay products:		
Crude clays, n.e.s.:		
Fuller's earth, dinas, chamotte	2,065	6,360
Kaolin	7,174	5,055
Products:		
Refractory (including nonclay brick)	6,424	7,334
Nonrefractory	139	116
Cryolite and chiolite	2	--
Diamond:		
Gem, not set or strung ---carats	20,000	4,731
Industrial ---do	175,594	19,351
Diatomite and other infusorial earth	260	11
Feldspar, leucite, nepheline, nepheline syenite	1,512	1,812
Fertilizer materials:		
Crude and manufactured:		
Nitrogenous	37,655	51,614
Phosphatic	7,550	6,178
Potassic	5,709	8,259
Other including mixed	334,101	272,535
Ammonia, anhydrous	310	226
Fluorspar	45	5
Graphite, natural	1,312	1,234
Gypsum, anhydrite, plasters	257	401

See footnotes at end of table.

Table 3.—Thailand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Iodine	2	3
Lime	182	140
Magnesite	644	1,469
Mica	158	104
Pigments, mineral, including processed iron oxides	1,254	1,567
Precious and semiprecious stones, except diamond:		
Natural ... kilograms	217,454	717,244
Manufactures ... do	1,884	4,093
Salt	152	196
Sodium and potassium	3,292	7,633
Stone, sand and gravel:		
Dimension stone:		
Crude:		
Calcareous (marble)	84	240
Slate	5	40
Other	1,476	705
Worked:		
Calcareous (marble)	1,298	2,400
Slate	125	120
Paving and flagstone	(1)	3
Other	69	227
Dolomite, chiefly refractory grade	14	11
Gravel and crushed rock	346	688
Limestone (except dimension)	4	45
Quartz and quartzite	1,064	402
Sand, excluding metal bearing	44	103
Sulfur:		
Elemental:		
Other than colloidal	7,220	33,244
Colloidal	11,874	351
Sulfur dioxide	13	(1)
Sulfuric acid	20	42
Talc and steatite	7,851	8,421
Other nonmetals, n.e.s.:		
Crude	4	4
Slag, dross and similar waste, not bearing	1,078	3,342
Oxides and hydroxides of barium, magnesium, and strontium	50	53
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumens, natural	119	3
Carbon black	9,476	12,825
Coal, all grades, including briquets	1,449	2,745
Coke and semicoke	17,492	31,331
Peat	20	--
Petroleum:		
Crude and partly refined:		
Crude ... thousand 42-gallon barrels	23,001	27,668
Partly refined ... do	32,104	13,992
Refinery products: [2]		
Gasoline, aviation ... do	636	134
Gasoline, motor ... do	390	154
Kerosine ... do	60	44
Jet fuel ... do	14	(1)
Distillate fuel oil ... do	5,580	6,251
Lubricants ... do	614	642
Other:		
Liquefied petroleum gas ... do	--	7
Mineral jelly and wax ... do	75	45
Nonlubricating oils, n.e.s ... do	359	2,446
Bitumen and others ... do	11	2
Bituminous mixtures, n.e.s ... do	7	3
Pitch, pitch coke, and petroleum coke ... do	12	76
Unspecified ... do	144	80
Total ... do	7,902	9,884
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	851	1,145

r Revised.
1 Less than ½ unit.
2 Includes bunkers.

COMMODITY REVIEW

METALS

Antimony.—Mine output of antimony ore from stibnite and stibiconite occurrences in 1975 was over 7,000 tons, grading about 42% contained metal. The bulk of the production was from provinces in the north and central regions. There are about 30 important antimony occurrences in Thailand with several mines operating at each of the richer occurrences. Production from mines in Phrae and Lampang Provinces accounted for nearly one-half of the country's total output. Two mines in the central region, one each in Kanchanaburi and Ratchaburi Provinces, had an annual output of about 1,100 tons of ore. The remainder of the production was from mines in Nakhon Si Thammaret and Surat Thani Provinces in the south.[6]

Production of metal during the year was about 300 tons, primarily from the plant of Siam American Mining Enterprise Co., Ltd., at Ban Nasan in Surat Thani Province. This plant, which uses a distillation process, had an annual capacity of 500 tons of metal.

Only a small portion of the antimony production was consumed locally for battery plate manufacture, printing lead, and matchstick production. In 1975, nearly 5,000 tons of ore valued at $3.2 million and about 300 tons of metal valued at $0.6 million were exported, making antimony the fifth most valuable mineral export. Overall mine output from Thailand ranked seventh in the world.

Iron and Steel.—Thailand produced slightly more than 32,000 tons of iron ore in 1975. A cutback in production by Siam Iron Co., Ltd., was nearly offset by the start of output by South Siam Metal Enterprise Co., Ltd., which began operations in October. Most of this domestically produced ore was smelted in Siam Iron and Steel Co.'s small charcoal-fired blast furnace plant at Ta Luang in Saraburi Province.

Production of pig iron continued to be small, but production of crude steel, bars, and billets increased about 47% to more than 500,000 tons in 1975. Plans for a major increase in steel bar production were firmed up by yearend. Five new electric arc furnaces reportedly under construction will increase the country's capacity from 445,000 tons per year in 1975 to 635,000 tons per year when completed in late 1976 or early 1977. Three will be installed by Bankok Iron and Steel Co., one at Bankok Steel Co. and one at Thai India Steel. The size of charge varies between 13 and 20 tons.[7]

Lead.—Lead ore production remained virtually unchanged at 3,600 tons. Value of the ore placed lead 10th among domestically produced minerals. Lead content of the ore averaged 43%. World market prices remained depressed since consuming countries had large stockpiles.

Manganese.—Output of battery-grade manganese in 1975 was nearly 3,600 tons, a decline of about 60%, whereas output of metallurgical-grade manganese increased 2% to over 20,000 tons. During the year, new deposits were discovered in Chiangmai and Loei Provinces.

Tin.—Thailand's most valuable mineral product, tin, contributed about two-thirds of the total value of mineral production in recent years (excluding cement). In 1975, the reported production of 73% concentrates dropped 20% to 22,397 tons, all of which was smelted at the Thaisarco smelter. However, Thailand's share of world production was still nearly 10%. The decline in tin production was partially due to the Thai Government's decision to revoke TEMCO's mining concessions. TEMCO produced 9% of Thailand's 1974 tin output and was expected to produce about 15% in 1975. Late in the year, the Government failed to renew five of seven mining leases of Southern Kinta Consolidated, Ltd., further cutting production.

Following the closure of TEMCO operations in the shallow waters off Phuket, some areas were taken over by a large number of unlicensed operators, who subsequently started to extract large quantities of tin by primitive diving methods. Reports indicated that much of this unlicensed tin was smuggled from Thailand into Burma and then marketed in Malaysia. Malaysia imported nearly 5,000 tons of tin-in-concentrate from Burma in 1975 compared with about 500 tons in 1974, even though Burma's production for 1975 remained at the 1974 level of 600 tons.[8]

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[6] Scholla & Associates (Bangkok). Antimony Deposits of Thailand. February 1976, 26 pp.

[7] Iron and Steel International. V. 49, No. 1, February 1976, p. 9.

[8] Work cited in footnote 3.

The Thai Government set aside certain offshore areas for some small-scale operators who were to be licensed to sell the tin concentrates within the country. The Government also established the State-owned Offshore Mining Organization (OMO) to administer and operate the former TEMCO leases. As an initial step, the Government decided to subcontract the OMO's offshore dredging to three companies—Billiton Thailand, Aokam Tin, and Thai Sanguan Co.—until the OMO could operate dredges on its own.

Exports of tin metal in 1975 were more than 16,000 tons valued at about $106 million, a decrease of 23% from 1974 exports of 20,768 tons. The major export markets for tin were the United States, Japan, the Netherlands, the U.S.S.R., and Singapore.

The worldwide recession had a marked effect on tin prices. Decreased demand caused tin prices to dip sharply, and the International Tin Council (ITC) had to resort to buffer stock purchases to support the market price during most of the year. The average Penang price for tin was 301 cents per pound in 1975 compared with 355 cents per pound in 1974, but prices were up again in early 1976.

Farber Merlin Ltd. developed an underground mine at Sichon and production was to begin in early 1976. Sierra Mining Co. continued to evaluate a proposed onshore dredging operation, also at Sichon. Chasintr Mining Co. opened the country's first open pit tin mine in Ban Juai Wan Khao, near Kanchanaburi and the Burma border. The mine was developed for $5 million and used unsophisticated but effective 2-cubic-meter excavators and a long conveyor-belt system. Tin concentrate production was eventually expected to reach 150 tons per month.

Labor problems were developing at yearend at two of Thailand's major offshore tin-dredging companies, Aokam Tin and Tongkah Harbour. A strike appeared imminent and, if extended, it could lower production significantly in 1976.

Tungsten.—Production of tungsten, Thailand's number two mineral, fell during 1975 to 3,441 tons of 60% WO_3 concentrates. This was nearly a 20% reduction from the 1974 tonnage and the third straight year of significant decline. Thailand ranked seventh in world production of tungsten, off from fourth place in 1973. The decline was attributed in part to political instability in the important Khao Soon mining area, and in part to the gradual depletion of the shallow, more easily mined ore reserves.[9] A decline in the output from Doi Mok in Chiangrai Province was also due to depletion of the deposit. Production from deeper ores in these major mines will involve difficult mining problems and higher costs.

Zinc.—Trial shipments of zinc concentrate continued to be made from the Mae Sot mine to the New Jersey Zinc Co. plant in Palmerton, Pa. Imports of zinc ore and concentrate at the Palmerton plant were reported at 28,000 tons of contained metal, about one-half of which was from inventories held at the Mae Sot mine. Mine output for the year declined.

Construction of a 60,000 ton-per-year electrolytic zinc refinery at Tak was awaiting Thai Government approval. The plant will be a joint venture between Thailand and the United States and the first such plant in Southeast Asia.

Other Metals.—As byproducts of tin mining, 103 tons of tantalite, 7 tons of columbite, and 367 tons of monazite were produced. Additionally, 1,760 tons of a tantalum-columbium (Ta-Cb) rich slag was recovered as the Thaisarco tin smelter. Prices obtained were not available for the individual concentrates, but in light of the high unit price for Ta-Cb oxide, the byproducts represent a substantial value-added in tin production.

NONMETALS

Barite.—Barite was the only important Thailand mineral to show increasing strength in 1975, ranking fifth in value of minerals produced. Production increased 28% in 1975 to over 258,000 tons, to meet the expanding demand in oil well drilling in Southeast Asia. Exports of 90,410 tons of ore were largely to beneficiation plants in Indonesia and Singapore. Exports of mud-grade barite, milled in Thailand, increased to 20,621 tons. Deposits are widespread, with output coming from about three major producers and many small independent ones. Recently, Dresser Industries opened a new large mine at Phetburi.

Cement.—Cement production remained at about 4 million tons in 1975. The International Finance Corp. (IFC) was lend-

[9] Pages 410–413 of work cited in footnote 3.

ing $10 million to help finance a $62 million expansion program for four companies in the Siam Cement Group. The portion of the plan for Siam Cement Co., Ltd., calls for adding 800,000 tons per year to cement capacity, constructing two cement distribution centers in Bangkok, and building facilities for loading clinker on ocean-going vessels. The increase in cement output was aimed at helping to meet growing domestic demand and take advantage of the export market. The new handling facilities would speed shipments and reduce transportation costs.[10]

Fertilizer Materials.—The potash deposits at Udon Thani were still being investigated by the Thai Department of Mineral Resources (DMR) with a view toward development. Because the deposits are located near the Laos border south of Vientiane, private prospecting in the area was prohibited. DMR applied for a budget of $1.25 million to finance a 2- to 3-year drilling program. Private interests estimated that at least $3.5 million would be needed to test the area thoroughly. The deposits are apparently large enough that with proper development Thailand could become an exporter of potash fertilizers to the Asian market.

Fluorspar.—The fluorspar market suffered a sharp decline during 1975 because of the severe drop in import demand by several countries, especially Japan, the major importer. Japan's cutback in Thai imports was due to a 20% reduction in steel output, adaptation of new steel-smelting techniques using less fluorspar, a more favorable long-term market supply from Kenya, and large politically motivated purchases from the People's Republic of China, which have left a surplus of fluorspar in stock.[11]

Production of metallurgical-grade fluorspar was about 175,000 tons, off 48% from the 1974 level. Low-grade fluorspar production was 111,000 tons, roughly a 26% increase over the 1974 level. However, an export market for the beneficiated acid-grade fluorspar was found for only one-quarter of the output. During the year, 32 mines closed, leaving 34 mines working at yearend. Prices of metallurgical-grade fluorspar sold to Japan began the year at about $44–$45 per ton but dropped later to $42 per ton as producers sold surplus stock to cover expenses. Value of fluorspar exports declined from $15 million in 1974 to $10 million in 1975.

DMR estimated recoverable reserves at 11,500,000 tons, based on prominent outcroppings of fluorspar that could be easily worked by open pit methods. No systematic exploration for fluorspar has been done, either on extensions of known lodes or for new deposits. Consequently, the possibility for major additional ore reserves was considered very high.[12] The long-term outlook for Thai exports appears promising despite the decrease in exports to Japan. As economic development of the region progresses, demand for fluorspar should increase significantly. Indonesia, Australia, and India are the likely new markets.

Gypsum.—Both domestic and export demand for gypsum declined for the first time in several years. Production fell to about 255,000 tons, a drop of 18%. Exports showed an even steeper slide from 117,672 tons to 89,000 tons. Malyaysia, Indonesia, and Taiwan were the major purchasers. The main cause of the decline was attributed to high freight and shipping costs, which have rendered Thai gypsum uncompetitive with other producers in the area.

MINERAL FUELS

Coal.—Lignite was the only domestically produced mineral fuel of significance, and output was just under 500,000 tons. DMR reported finding new deposits of lignite in Krabi Province in the south; the deposits were being evaluated. The Electricity Generating Authority of Thailand switched from heavy oil to lignite at some of its generating plants in an effort to save on expensive imported oil.

Petroleum and Natural Gas.—Petroleum imports continued to be a major expense in the Thai foreign-exchange picture. Total cost of mineral fuels imports in 1975 was $710 million, by far the largest single import category. Total domestic production of crude oil was reported as less than 300 barrels per day. Crude oil imports were refined at the country's three main refineries—Thai Oil Refinery Co., Esso Petroleum Co., Ltd., and Summit Industrial Corp.—which had a total processing capacity of nearly 170,000

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[10] Rock Products (Chicago). V. 79, No. 4, April 1976, p. 100.

[11] Business Review (Thailand). Association Report. V. 4, No. 2, March 1976, p. 83.

[12] Scholla & Associates (Bangkok). Fluorspar Deposits of Thailand. November 1975, 23 pp.

barrels per day. The Government was expected to take over Summit shortly and Thai Oil by 1981.

Exploration for petroleum and natural gas continued in the offshore areas under Thai control. Union Oil Co. announced separate natural gas discoveries in block 12 of 60 and 26 million cubic feet per day and condensate yields of about 2,000 and 1,000 barrels per day. Testing of the wells discovered earlier in blocks 12 and 13 indicated an average yield of 30 barrels of condensate per million cubic feet of gas.[13] Both the company and Thai officials felt that reserves were sufficient for commercial exploitation to begin at a projected rate of 150 million cubic feet per day. The main factor preventing signing of a long-term contract between Union Oil Co. and the Government was the price being asked, $1.60 per 1,000 cubic feet over a 20-year contract. Thai officials wanted the price adjusted downward every 5 years as the investment costs were repaid. Plans were being made for laying a pipeline from the field, which is located about 95 miles east of Surat Thani, northward to the capital. Cost of a 150-million-cubic-foot-per-day pipeline was estimated at $180 million and only slightly more than a 300-million-cubic-foot-per-day line. Financing of the pipeline was also being negotiated. Gas could be flowing within 3 years of contract signing. Initial customers for the gas would be the thermal powerplants in the Bangkok area, which would be converted to gas as soon as it became available. Market demand for the gas should expand quickly if the price of the delivered gas is held below the equivalent imported petroleum price.

Drilling was started in late 1975 by Union Oil Co. and Esso Exploration Inc., in their respective concessions in the Adaman Sea off the west coast. Esso was using the just-completed *Discoverer 534* self-contained drilling ship owned by the Houston-based Offshore Co. This was reported to be the most sophisticated drilling vessel in the world, and was being leased by Esso for $100,000 per day. Its first well was spudded in 2,300 feet of water, but proved dry, was sealed, and abandoned after reaching over 11,000 feet. Drilling was to continue throughout 1976 by both Esso and Union Oil Co. One of the planned holes was to be in 2,632 feet of water, a record depth for commercial exploration.[14]

Thailand had not been able to take advantage of 312,000 tons of Chinese crude oil arranged for at a friendship price. The high-pour-point oil posed major problems in handling and refining at the Bangchak refinery. Modification of the handling and refining equipment was reportedly underway at yearend.

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[13] Pages 57–61 of work cited in footnote 11.
[14] U.S. Embassy, Bangkok, Thailand. State Department Airgram A–88, Apr. 21, 1976, 8 pp.

The Mineral Industry of Tunisia

By E. Shekarchi [1]

The mining and chemical sectors of the Tunisian economy—the best performers of 1974—were depressed by a strong world market reaction to high phosphate prices. Although mining continued apace, a large portion of phosphate rock production was stockpiled rather than offered at lower prices to stimulate sales. Phosphate processors halted operations for several months due to the low world price for triple-superphosphate and phosphoric acid; overall production in the chemical industry declined 15%. The energy sector was mixed; petroleum revenues decreased because of a fall in crude prices for Tunisia. Increased production of lower grade crude from the Ashtart offshore field compensated for the continuing decline at El Borma oilfield. Announced offshore natural gas reserves of over 100 billion cubic meters promised future developments in the chemical industry.

The preliminary gross national product (GNP) for 1975 based on current prices, was estimated at \$3.5 billion,[2] a 9% increase compared with the 1974 GNP. Per capita GNP increased 10% in 1975 compared with that of 1974.

Details of the fifth plan (1977–81) were still being developed although some priority sectors and projects were announced by the latter part of 1975. Investment for the fifth plan was targeted at \$1.8 billion to \$2.1 billion per year. Projects and plans affecting the mineral industry were as follows:

Natural Gas.—The Government appeared committed to developing the offshore natural gasfield at a cost of about \$1.2 billion in order to attract gas-based industries. The Government was to seek foreign participation in the development, which will require major foreign engineering, construction services, and equipment.

Oil Refinery.—To reduce Tunisian imports of refined petroleum products, the Government plan called for immediate major expansion of the Bizerte refinery.

Phosphates.—A major expansion program in phosphate mining and processing was foreseen including a proposed nitrogenous-phosphatic fertilizer plant. Specifications for the plant were not given.

Cement.—To supplement the construction of three cement plants underway in 1975 which would increase cement production by over 2 million tons, the fifth plan proposed construction of two additional plants. Tunisia imported over half of its cement needs in 1975, but with the realization of the fifth plan, it could become a net exporter of this commodity.

Transportation.—The Tunisian fifth plan foresaw a railway modernization, including a new track, introduction of a standard gage line, rolling stock, signal systems, a new terminal for Tunis, and a linkup with the Trans-Maghreb railroads.

Energy.—A major investment program was to be undertaken by the State Power Company designed to double power output by 1981. Tenders were issued for a 300-megawatt steam-generating plant and two gas turbine plants totaling 90 megawatts. Further generating and distribution infrastructure was to be added to the 1975 facilities.

From numerous bids submitted to the Tunisian Government for chemical processing plants, only Oronzio De Noro of Milan and Spie-Batignolles of France were awarded a contract for the design of a 750-ton-per-day sulfuric acid plant for Société Industrielle d'Acide Phosphorique et d'Engrais at Sfax. Construction began in mid-1975 and completion was expected

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[2] Where necessary, values have been converted from Tunisian dinars (TD) to U.S. dollars at the rate of TD1=US\$2.30.

in 1976. The financing arrangements of this project were not disclosed by yearend 1975.

The establishment of the El Borma natural gas pipeline and an agreement for the construction of the major Algerian-Tunisian-Italian natural gas pipeline to export natural gas to Europe remained in the planning stage at yearend 1975. No firm decision was made, because financial backing for the entire project was unresolved.

The Tunisian national oil company, Établissement Tunisienne pour l'Activité Pétroliers (ETAP), which was created by law in 1972, and actually established in mid-1974, became more actively involved in all phases of the country's petroleum activity in 1975 ETAP functioned as a diversified petroleum company, which participated in all joint ventures with foreign companies and planned eventually to conduct its own exploration and development program. While ETAP did not negotiate new concessions in 1975, the organization became directly involved in issuing drilling permits and other licenses and was free to inspect any petroleum activity in Tunisia as a consultant to the Tunisian Government.

PRODUCTION AND TRADE

The available data on mineral production and trade are given in the following tables:

Table 1.—Tunisia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Iron and steel:			
Iron ore and concentrate, gross weight thousand tons	809	818	616
Pig iron do	157	118	6
Steel, crude do	[2] 137	106	129
Lead:			
Mine output, metal content	15,576	12,504	10,916
Metal, primary, unalloyed [3 4]	[r] 25,968	26,820	23,396
Mercury metal, primary 76-pound flasks	112	85	--
Silver metal, primary thousand troy ounces	190	136	[e] 130
Zinc, mine output, metal content	8,592	6,240	6,458
NONMETALS			
Barite	18,566	17,366	14,900
Cement, hydraulic thousand tons	550	540	620
Clays, construction [e] do	230	160	255
Fertilizer materials:			
Crude natural, phosphate rock do	3,474	3,823	3,488
Manufactured:			
Hyperphosphate do	24	51	9
Superphosphate do	50	30	51
Triple superphosphate do	400	400	304
Fluorspar:			
Chemical grade	43,304	28,318	33,917
Metallurgical grade	3,296	--	--
Total	46,600	28,318	33,917
Lime, hydraulic thousand tons	132	146	283
Salt, marine do	355	244	296
MINERAL FUELS AND RELATED MATERIALS			
Gas:			
Natural:			
Gross production million cubic feet	4,513	[e] 7,600	35,315
Marketed production do	4,026	7,098	7,497
Manufactured do	667	670	[e] 690
Natural gas liquids, natural gasoline thousand 42-gallon barrels	([5])	--	--
Petroleum:			
Crude oil do	29,828	31,841	35,532

See footnotes at end of table.

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

Commodity [1]	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline ---------- thousand 42-gallon barrels --	798	1,105	1,118
Kerosine ---- do ----	566	707	650
Distillate fuel oil ---- do ----	2,161	2,101	2,541
Residual fuel oil ---- do ----	2,956	3,115	3,287
Other ---- do ----	883	761	748
Refinery fuel and losses ---- do ----	1,031	400	460
Total ---- do ----	8,395	8,189	8,804

e Estimate. p Preliminary. r Revised.
[1] In addition to the commodities listed, a variety of crude construction materials (common 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.
[2] Crude steel for casting only.
[3] Pig lead only (excludes lead content of antimonial lead).
[4] From domestic and imported ores.
[5] Revised to none.

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

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal including alloys: all forms	r 266	113	Belgium-Luxembourg 75; Italy 26; France 12.
Copper metal including alloys, all forms	926	561	Belgium-Luxembourg 285; West Germany 116; France 67.
Iron and steel:			
Ore and concentrate	423,830	526,354	Italy 277,000; West Germany 175,024; France 48,095.
Metal:			
Scrap	3,896	1,974	All to Italy.
Pig iron and ferroalloys	15,518	7,116	Do.
Steel, primary forms	59,580	40,046	Turkey 19,179; Italy 8,332; Morocco 6,011.
Semimanufactures	r 69,916	44,557	Algeria 18,038; United States 7,999; United Kingdom 5,617.
Lead:			
Ore and concentrate	6,176	--	
Metal including alloys, all forms	16,665	24,540	Italy 11,710; Greece 5,516; Algeria 2,902.
Mercury ---- 76-pound flasks	90	561	All to Italy.
Nickel metal, scrap	29	--	
Silver ---- troy ounces	--	67,677	All to France.
Zinc:			
Ore and concentrate	15,200	10,600	Italy 3,800; Bulgaria 3,000; Yugoslavia 2,100.
Metal including alloys	101	29	All to France.
NONMETALS			
Barite and witherite	13,050	6,050	All to Italy.
Cement	412	491	Algeria 446; Libya 45.
Clays and clay products (including all refractory brick):			
Crude clays	23	29	All to Spain.
Products, nonrefractory	57,836	62,015	All to Libya.
Feldspar and fluorspar	33,020	25,566	Italy 20,316; United States 5,250.
Fertilizer materials, phosphatic:			
Natural ---- thousand tons	2,377	2,651	France 675; Czechoslovakia 278; Poland 221.
Manufactured ---- do ----	389	399	Indonesia 121; France 46; Belgium-Luxembourg 39.
Lime	70	--	
Salt and brine	307,209	259,253	Norway 84,945; Iceland 49,740; Italy 42,813.
Sulfur, sulfuric acid, oleum	8,946	5,379	All to Italy.

See footnote at end of table.

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

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude thousand 42-gallon barrels	28,326	28,730	Italy 7,261; France 6,651; Greece 4,969.
Refinery products:			
Gasoline do	5	1	Mainly to bunkers.
Kerosine do	494	443	All to bunkers.
Distillate fuel oil do	86	49	Do.
Residual fuel oil do	32	131	Greece 67; Bunkers 64.
Lubricants do	5	6	Mainly to bunkers.
Total do	622	630	

r Revised.

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

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum metal including alloys:			
Unwrought	--	1	All from United Kingdom.
Semimanufactures	r 1,123	1,385	France 513; West Germany 201; Belgium-Luxembourg 195.
Chromium oxide and hydroxide	3	3	West Germany 2; Netherlands 1.
Copper metal including alloys, all forms	1,573	2,102	France 1,381; Belgium-Luxembourg 256.
Gold metal, unworked or partly worked thousand troy ounces	26	20	Switzerland 19.
Iron and steel:			
Ore and concentrate	37	--	
Metal:			
Scrap	282	480	Algeria 211; Netherlands 193.
Pig iron and ferroalloys	1,017	711	France 597.
Sponge iron, powder, shot	63	87	France 53; Italy 29.
Steel, primary forms	6,555	7,218	France 3,464; Italy 2,633.
Semimanufactures	r 116,357	106,152	France 39,473; West Germany 27,071; Belgium-Luxembourg 16,445.
Lead:			
Ore and concentrate	(1)	26,715	Morocco 16,580; Algeria 6,334; Italy 3,801.
Oxides	63	54	France 49.
Metal including alloys, all forms	45	49	France 40; United Kingdom 4.
Magnesium metal including alloys, all forms	(1)	1	Mainly from West Germany.
Mercury 76-pound flasks	17	3	Mainly from France.
Nickel metal including alloys, all forms	11	7	France 4; Canada 2.
Platinum-group metals and silver metals, including alloys:			
Platinum group troy ounces	772	64	All from Belgium-Luxembourg.
Silver do	r 112,334	97,770	Sweden 50,155; Italy 28,774.
Tin metal including alloys, all forms	55	52	Malaysia 29; France 10; Italy 10.
Titanium oxide	415	511	West Germany 211; France 104; Belgium-Luxembourg 103.
Zinc:			
Oxide	378	213	France 113; West Germany 50; Belgium-Luxembourg 26.
Metal including alloys, all forms	1,178	1,337	Italy 455; France 270; Yugoslavia 267.
Other:			
Ore and concentrate, n.e.s	29	29,567	Morocco 18,081; Algeria 6,334; Italy 5,152.
Oxides, hydroxides and peroxides of metals, n.e.s	66	215	United Kingdom 100; Algeria 60; West Germany 44.
Base metals including alloys, all forms, n.e.s	42	31	Belgium-Luxembourg 20; Italy 5; People's Republic of China 5.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	47	89	Italy 55; France 34.
Grinding and polishing wheels and stones	151	296	Netherlands 203; Italy 54.

See footnotes at end of table.

Table 3.—Tunisia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Asbestos	1,121	1,019	Canada 410; Italy 406.
Barite and witherite	2,976	5,702	France 5,096; Greece 600.
Boron materials:			
Crude natural borates	2	3	All from France.
Oxide and acid	31	73	Italy 70.
Cement	151,448	444,083	U.S.S.R. 180,203; Greece 135,741; Romania 68,668.
Chalk	489	971	All from France.
Clays and clay products (including all refractory brick):			
Crude clays	11,228	18,312	France 8,029; Morocco 3,193; United Kingdom 2,757.
Products:			
Refractory	5,132	5,598	Austria 1,509; France 1,296; Italy 807.
Nonrefractory	19	45	All from France.
Diatomite and other infusorial earth	71	104	France 79; United States 13; Spain 10.
Feldspar and fluorspar	1,206	1,458	All from France.
Fertilizer materials:			
Manufactured:			
Nitrogenous	56,893	69,515	United Kingdom 22,688; Romania 22,402; France 12,940.
Phosphatic	--	(1)	All from France.
Potassic	7,299	18,739	Belgium-Luxembourg 12,178; France 6,560.
Other, including mixed	296	6	West Germany 5; France 1.
Ammonia	99	310	Netherlands 177; France 96; West Germany 32.
Graphite, natural	1	1	All from France.
Gypsum and plasters	21	40	Do.
Lime	11	25	Do.
Magnesite	--	4	Austria 2; France 2.
Mica, all forms	7	47	Italy 42; France 5.
Pigments, mineral, including processed iron oxides	195	101	West Germany 88; France 13.
Pyrite (gross weight)	5,000	--	
Salt and brine	20	2	France 1; Netherlands 1.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	5,790	6,289	Italy 3,781; France 1,942.
Caustic potash, sodic, potassic peroxides	11	71	France 64.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	4,856	5,570	Italy 5,389.
Worked	6	280	Italy 271.
Dolomite, chiefly refractory grade	232	115	Italy 80; France 35.
Gravel and crushed rock	1,314	2,664	Italy 2,304; France 317.
Quartz and quartzite	490	1,130	Belgium-Luxembourg 990; Italy 140.
Sand excluding metal bearing	103	298	Norway 248; France 50.
Sulfur:			
Elemental, all forms	66,506	372,977	United States 115,356; Poland 92,259; Mexico 68,887.
Sulfuric acid, oleum	9,186	6,703	Italy 3,702; Norway 2,502.
Talc, steatite, soapstone, pyrophyllite	2,091	1,784	France 1,291; Italy 490.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,000	62	Italy 57.
Coal, all grades, including briquets	32,518	35,531	U.S.S.R. 12,906; United Kingdom 7,243; Spain 6,171.
Coke and semicoke	78,933	141,882	West Germany 74,476; Italy 64,236.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	7,623	7,167	Saudi Arabia 3,748; Iran 3,361.
Refinery products:			
Gasoline do	453	17	Italy 16.
Kerosine do	215	1,250	Italy 510; Greece 180; France 119.
Distillate fuel oil do	575	1,335	Italy 1,276.
Residual fuel oil do	1,005	(1)	All from France.
Lubricants do	107	119	Italy 44.
Mineral jelly and wax do	3	6	People's Republic of China 3; Indonesia 2; West Germany 1.
Other do	r 157	145	Italy 132.
Total do	r 2,515	2,872	

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Iron and Steel.—Iron ore production decreased by 25% in 1975 compared with the 1974 output. Most iron ore was produced from the Djebel Djerissa mine with a lesser amount from the Tamera mine. The State-owned El Fouladh iron and steel mill produced a total of 129,000 tons of ingot, slightly more than in 1974. The proposed direct reduction iron plant at Qabis was tabled temporarily mainly because of the scarcity of natural gas for the plant and the estimated high construction cost of $55 million.

Lead.—Lead ore as well as lead metal production decreased substantially in 1975 from that of 1974. All of the lead ore was produced by the Government-owned mining company Société Tunisienne d'Expansion Minière (SOTEMI) and all lead concentrates were smelted by Société Peñarroya Megrine (SPM) smelter. The SPM smelter was dependent for feed upon imported lead concentrates from Morocco, Algeria, Italy, and other countries. Refined lead was exported to Greece, 7,700 tons; Italy, 6,000 tons; and Algeria, 4,000 tons. Lead ore production (43% to 55% Pb) in 1975 amounted to 17,827 tons compared with 20,761 tons in 1974. Refined lead production in 1975 amounted to 23,396 tons compared with 26,820 tons in 1974.

Zinc.—The Fradj Hassan mine remained in the development stage with no production reported by yearend 1975. Domestic production of zinc concentrate from mines located in western Tunisia was about the same in 1975 as in 1974. SOTEMI was the sole zinc producer in the country. Zinc ore (45% to 55% Zn) in 1975 amounted to 12,917 tons compared with 12,411 tons in 1974. No output of refined zinc was reported in 1975, but in 1974 output was reported as 534 tons.

Other Metals.—Production of silver, a byproduct of lead smelting, was reduced substantially in 1975 compared with 1974 output.

NONMETALS

Cement.—Production of cement in the Bizerte and Tunis plants reached a new height in 1975. Domestic demand for cement, particularly in the construction industry remained strong. In the fifth plan, the Government planning organization projected that by 1980 cement production from Tunisia would reach 2 million tons.

The construction of two new cement plants, Qabis with a 700,000-ton-per-year capacity and Thala with a 1-million-ton-per-year capacity, was on schedule. The Thala cement plant near the Algerian border was to be jointly operated by Algeria and Tunisia. Although the cement production of 620,000 tons was the highest in Tunisian history, an equal amount had to be imported during 1975 to meet demand.

Fertilizer Materials.—*Phosphates.*—Production of rock phosphate decreased 9% in 1975 compared with that of 1974. The fifth plan, announced by the Government in the latter part of 1975, envisaged doubling phosphate rock production to about 7 million tons annually within 6 years. Cie. des Phosphates de Gafsa (CPG), owned by the Tunisian Government, obtained clearance to invest $322 million on an expansion plan. The main goal of this expansion plan was to increase exports to 4.5 million tons by 1981 from 2.2 million tons in 1975. The Government also expected domestic demand for phosphate rock to be doubled from 1.2 million annually to 2.5 million tons by 1981. Under the new program CPG planned to invest $156 million in developing new phosphate deposits in Sehile and Kef Echfaier, south of the Metlaoui deposits. Also, $101 million was earmarked to finance the mechanization of production facilities at the Redeyef, Metlaoui, and M'Dhilla mines. About $66 million was to be spent in modernizing rail communication between the mines and Sfax, the phosphate export port on the Mediterranean. The gradual increase of phosphate production was predicted to be 3.5 million tons in 1975, to 4.1 million tons in 1976, to 6.2 million tons in 1980, and to 7.1 million tons in 1981.

About 90% of phosphate production in 1975 came from the seven mines of the Cie. des Phosphates et du Chemin de fer de Gafsa located in a line northwest from the town of Gafsa to the Algerian border. The remaining 10% was produced by Société Tunisienne d'Exploitations Phosphatières which operated the Kalao Djerda mines about 200 kilometers southwest of the capital.

The expansion program of the new Sehibe mine, in the Gafsa phosphate basin, financed by the World Bank, continued on schedule in 1975. Production at an initial rate of 1.2 million tons annually was to begin in 1976. When in full production in 1980, this mine alone was to contribute substantially to phosphate production for export. Apparently the World Bank loan of $2.3 million was at an interest rate of 7.25% per year for 15 years, including a 3-year grace period.

The Government, in order to strengthen its control over the chemical and the phosphate processing sector of the economy, was negotiating to purchase a nitrogen-phosphorus-potassium (NPK) triple superphosphate plant belonging to the Swedish company Supra Aktiebolag, International Finance Corporation, and a U.S. firm, Freeport International, a subsidiary of Freeport Minerals Company. Terms of the purchase were not available by yearend 1975. However, it appeared that the Government of Tunisia would assume a dominant role in all important sectors of the national economy and in the marketing of basic commodities.

Geologically the Gafsa basin extends from the town of Gafsa toward the Algerian border. The phosphate beds belonging to the Thanetian time range in thickness from 15 to 25 meters. Within the phosphatic suite much variation in the number, grade of ore, and thickness of individual ore-bearing beds was noted from one part of the basin to another. However, a total of eight beds was distinguished as constituting a potentially minable horizon. The phosphorite occurred generally as rather soft, friable, greenish or brown rocks, almost invariably separated by varying thicknesses of marl or limestone. These marls, when they formed hanging walls of a phosphate bed, were a continuing source of trouble to miners, because they had a marked tendency to expand and collapse into the working area as soon as they were exposed to the air. To overcome this problem, Tunisian operators imported a great deal of timber for roof supports from Poland and France each year, which constituted a sizable expense.

In the Gafsa basin, four beneficiation plants were set up, each one to treat specifically one of the various types of ore mined. However, as the mine reserves were depleted, the beneficiation procedure, geared to handle one specific type of ore, was found unsuitable for some of the rock mined; consequently, the company was forced to change from dry beneficiation to wet techniques. In some instances the ore had to be transferred to the wet beneficiation center at Meltaoui, 37 kilometers away.

Fluorspar.—Production of chemical-grade fluorspar at the mines in the Zaghousan region of central Tunisia in 1975 was 20% above that of 1974. Construction of the new aluminum fluoride plant at Gabes to utilize domestic fluorspar continued on schedule during 1975. The plant, slated to begin operation in the latter part of 1976, with a 23,000-ton-per-year capacity was being constructed under the direction of the National Chemical Fluorine Company at an estimated cost of $14 million. It was to be financed by the Tunisian Economic Development Bank and by loans from French banks and the International Finance Corporation, a member of the World Bank.

Fluorspar feed stock for the new plant was to come from SOTEMI, sulfuric acid from Maghribe Chemical Industries, and aluminum was to be imported from abroad. It was estimated that the new plant would earn close to $15 million in foreign exchange as early as 1977 and would provide 240 new jobs in the southern region of the country.

Other Nonmetals.—Barite production compared with that of 1974 decreased 14% in 1975, while the production of clay, hydraulic lime, shale, and sand and gravel increased significantly, reflecting a substantial demand for construction material. Most of the barite production was consumed locally for oil drilling mud. Production of marine salt in 1975 increased considerably compared with that of 1974. A greater portion of the salt production was consumed in the tanning industry.

MINERAL FUELS

Natural Gas.—According to reports published by the Ministry of National Economy, 1 billion cubic meters of natural gas were produced in 1975. Of this amount 212 million cubic meters were used for power generation and industrial purposes, and 800 million cubic meters were flared. Most of the production was from the El Borma Field, while a small amount, 2.3 million cubic meters, was produced in the

Cap Bon Field. No figures were available on production of natural gas from other oilfields by yearend 1975. According to the feasibility study on the Tunisian natural gasfields completed in 1975, Tunisia had a gas reserve of 50 billion cubic meters in the Continental Shelf area alone. The Government of Tunisia intended to put these reserves onstream with a collection system capable of producing about 3.5 billion cubic meters of natural gas annually. This energy source was to be used for the petrochemical industry and for fixed installations already established in Tunisia such as cement plants, steel facilities, and power generating stations which relied on fuel oil or coke in 1975. All the gasfields in the Continental Shelf were in a permit area held by the French company Société Nationale des Pétroles d'Aquitaine/Entreprise de Recherches et d'Activitiés Pétrolières (Aquitaine/ERAP). Additional gas reserves in the Gulf of Qabis, when discovered, were to be tied to the gathering system. The Government expected to undertake engineering studies and actual construction in 1976.

Petroleum.—Crude petroleum production increased about 11% in 1975 compared with that of 1974. Ashtart, an offshore oilfield was a leading producer with 2.3 million tons, followed by the El Borma Field with 1.8 million tons. Two smaller producers Douleb and Sidi El Itayem, contributed 174,000 tons and 210,000 tons, respectively, to the 1975 production.

At yearend 1975, there were approximately 14 valid exploration permits and 1 new production-sharing permit for a total of 150,000 square kilometers as compared with 21 permits for 187,000 square kilometers at the beginning of the year. Of these permits, six covered both onshore and offshore areas, three were for onshore areas, five were on the Continental Shelf, and one was in deep water (beyond a 200-meter depth). Exploration activity in 1975 was about one-half of that during 1974, with the major reduction taking place onshore. Eight wildcat wells were drilled, half of which were offshore, resulting in gas discovery in the Miskar Field east of Ashtart and at Hastrubal on an adjoining permit; both properties were held by Aquitaine/ERAP. The same company also made an oil discovery very close to the controversial Libyan-Tunisian shelf boundary. At the promising Isis oilfield, discovered in early 1975, very little offshore drilling was reported due to a dispute between the Tunisian and Libyan Governments. Although the Mediterranean median line between the two countries was under study, no solution had been agreed upon by yearend 1975.

Total consumption of refinery products in 1975 increased 13% over that of 1974, because of a 48% increase in consumption of distillate fuel oil, a 6% increase in motor gasoline, and a 5% increase in jet fuel and kerosine. The only decrease in consumption was of 7.5% in residual fuel oil.

The Mineral Industry of Turkey

By E. Shekarchi [1]

The mineral and metallurgical industry of Turkey in 1975 was not as successful as in the previous year. Slight decreases in production of iron ore, primary copper, and lead-zinc ores were noted, while a significant decline in the production of pyrite, mercury, magnesite, antimony, bauxite, and boron minerals were registered. The only production increases were in chromite and manganese. Based on the Turkish State Institute of Statistics' figures, the growth rate of real gross national product (GNP) in 1975 reached 7.9%. This compared favorably with real growth of 6.9% in 1972, 6.6% in 1973, and 7.1% in 1974. Per capita income at 1975 prices increased to $900.[2] Workers remittances from abroad were down by 9% for 1975 to $1.3 billion.

In mid-April, the Turkish Parliament passed legislation enabling the Government to set up a State Industry and Labor Investment Bank. The Government was directed to inaugurate the bank and its branch offices in 2 years. The Treasury Department was to own 85% of the total capital stock, and to the extent feasible, this was to be sold to workers abroad as well as domestically. The remaining 15% equity was to be raised by State-owned enterprises and the Ministry of Industry and Technology. Turkish workers abroad who bought shares in the bank were to be guaranteed a 12% return on investment. The bank envisaged, by this method, to induce Turkish workers abroad, particularly in West Germany, to remit funds in West German banks estimated at $3 billion.

Turkey's associate membership in the Economic Communities (EC) and the goal of full membership by 1995 worked for an advantage when, finally, the right of a large number of Turkish workers to remain in Europe and thereby keep incoming remittances of foreign exchange high was approved by the EC Council of Ministers.

Turkish Government policy and existing legislation welcomed foreign investment provided that it responded to clearly delineated national criteria. Foreign investment was to contribute positively to economic development, contribute to exports, and introduce new technology; it was not to displace Turkish enterprises or entail a monopoly. Nevertheless, foreign direct investment in Turkey, which appeared to have gathered momentum in the 1950's and early 1960's, has for a variety of reasons stagnated in recent years.

The State-owned Turkish Fertilizer Corporation (Azot Sanayi T.A.S.) announced in December that it had awarded a contract to Kellogg International for engineering and consulting services on its proposed $100 million ammonia plant at Gemlik. Financing details remained to be worked out, but it was reported that Libya has agreed to provide 50% of the financing for the new plant.

In April 1975, Gubre T.A.S. (Fertilizer Plant Corporation of Turkey) inaugurated at Iskenderun a major fertilizer complex with a capacity of 230,000 tons per year of sulfuric acid and 150,000 tons per year of phosphoric acid. The same corporation had previously established at Yarimca, Izmit, a similar complex which was designed to produce 150,000 tons per year of phosphoric acid and 100,000 tons per year of triple superphosphate. Total cost of the two projects was estimated at about

[1] Supervisory physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from Turkish lira (Lt) to U.S. dollars at the rate of Lt14=US$1.00.

$36 million and was to save Turkey $90 million per year through import substitution.

The International Finance Corp. (IFC) agreed to finance Boru Sanayii A.S. (BORUSAN) in building a new steel pipe plant at Gemlik. The IFC purchased 10% of the equity in BORUSAN's new investment which was eventually to cost approximately $4 million. The IFC also confirmed in mid-1975 that it would join Koc Holdings and other private investors in forming a company which was to set up a gray iron castings plant with a capacity of 22,000 tons per year. The project aimed to supply a substantial portion of the casting requirements of the tractor and automotive manufacturing industries of Turkey. IFC was to provide equity capital of $1.4 million and a loan of $7.5 million for this project.

The full text of the crude oil pipeline agreement between Turkey and Iraq was published in the Turkish Official Gazette of June 17, 1975. Remuneration for the transport across the Turkish territory of crude oil originating in Iraq and for the loading of such crude oils on tankers at the terminal was fixed at $0.35 per barrel. The Iraqis agreed to sell the Turkish Government crude oil from the Iraqi pipeline in the amount of 10 million tons per year between 1977–79, 12 million tons per year from 1980–82, and 14 million tons per year in 1982 and thereafter. Construction of the pipeline and other facilities was expected to be completed within a period of 14 months. Mannesmann-Thyssen of West Germany was handling the entire project, covering a distance of 981 kilometers. Some 640 kilometers of the pipeline was in Turkish territory. Turkey and Iraq also agreed to set up a joint transport company to handle miscellaneous imports and exports. The proposed company planned to handle most of Iraq's imports from Europe via Turkey.

In June, the Turkish Government and the Soviet Union reached an agreement to increase the capacity of the Iskenderun steel plant from 1 million to 4 million tons per year, to expand the Seydisehir aluminum installations, and to set up two lignite-fired thermal powerplants with a capacity of 400 megawatts each in Cannakale and Bolue Provinces. New areas for the expansion of economic technical cooperation between the two countries were under consideration, and a 10- to 12-year loan of approximately $600 million for the machinery, material, and equipment was to be provided by the Soviet Union. Turkey was to reimburse this loan by exports to the U.S.S.R. A joint committee was to be established to improve the management of economic and technical cooperation between these two countries.

The United Nations Development Program (UNDP) agreed to assist in the exploitation and development of uranium deposits in the southwestern part of Turkey. The project was to be carried out by the State-owned Maden Tetkik ve Arama Enstitüsü (MTA), the Mineral Research and Exploration Institute of Turkey, assisted by the Turkish Atomic Energy Commission, the Turkish Coal Enterprise, and Etibank, under the coordination of the Ministry of Energy and Natural Resources.

Mining activities in Turkey were governed by Mining Law 6309, enacted in 1954, Petroleum Law 6324 of 1954, and the amended Petroleum Reform Law 1702, of 1973. The bill to nationalize the extraction of boron, lignite, and other unspecified strategic minerals, which was drafted and revised by previous governments, had not yet been approved by parliament.

Exploration programs for base metal anamolies were continued and mineral water resources were catalogued by MTA. In 1975, on the basis of MTA's surveys, detailed geological and hydrogeochemical studies of the geothermal fields, geophysical resistance studies and gradient drilling, a pilot turbo generator of 0.5-megawatt capacity was installed in the Denizli-Sarakoy area.

PRODUCTION

Table 1 gives the production of primary minerals and processed metals and nonmetals.

Table 1.—Turkey: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
METALS			
Aluminum:			
Bauxite	352,100	664,909	569,803
Metal	--	1,900	16,500
Antimony:			
Ore:			
Gross weight	[r] 41,547	40,573	24,562
Mine output, metal content	[r] 6,066	5,924	3,586
Regulus	63	543	850
Chromite ore (48% Cr_2O_3 content) thousand tons	261	316	450
Copper:			
Mine output, metal content	30,200	40,700	43,500
Metal:			
Smelter output:			
Primary	24,264	[r] 29,577	26,950
Secondary	450	NA	NA
Refined output	15,000	29,600	21,400
Iron and steel:			
Iron ore, gross weight thousand tons	2,570	2,256	2,230
Pig iron and ferroalloys:			
Ferrochromium [e]	9,500	9,500	9,500
Pig iron and other ferroalloys thousand tons	896	1,200	[e] 1,200
Crude steel (including castings) do	1,163	1,458	1,794
Lead:			
Mine output, metal content [1]	[r] 4,562	4,842	4,693
Smelter	5,500	5,600	3,000
Manganese ore, gross weight	3,708	3,240	33,937
Mercury 76-pound flasks	[r] 8,738	8,877	5,421
Zinc, mine output, metal content [2]	[r] 24,700	31,600	26,600
NONMETALS			
Abrasives, natural emery	92,292	149,772	70,700
Asbestos	4,776	15,586	15,589
Barite	89,808	45,732	9,854
Boron minerals	525,588	1,038,588	970,951
Cement, hydraulic thousand tons	8,952	8,940	10,833
Clays:			
Bentonite	[r] 7,810	13,420	39,764
Kaolin	[r] 23,987	25,100	21,735
Other	[r] 44,041	77,612	230,673
Fertilizer materials, all type	667,897	574,250	537,612
Fluorspar	1,935	1,428	1,405
Gypsum [e] thousand tons	358	357	433
Magnesite, crude ore	[r] 351,119	520,767	458,869
Meerschaum kilograms	22,200	20,850	30,900
Perlite	[r] 14,736	17,963	10,527
Pyrite, cupreous, gross weight	43,530	76,249	23,564
Salt, all types thousand tons	889	913	740
Sodium sulfate	36,838	55,504	79,646
Stone, sand and gravel, n.e.s.:			
Limestone thousand tons	[3] 430	[3] 428	7,000
Marble	34,300	28,900	18,700
Quartzite	[r] 114,113	NA	NA
Sand, siliceous	[r] 59,480	31,226	27,612
Shale (argillite)	13,929	NA	NA
Sulfur:			
Native, other than Frasch	17,748	10,476	19,450
Content of pyrite	20,268	35,456	[e] 35,000
Byproduct	29,200	[e] 29,000	[e] 29,000
Total	67,216	[e] [r] 74,932	[e] 83,450
Wollastonite	10,295	NA	NA
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural thousand tons	[r] 289	340	474
Coal:			
Bituminous do	4,643	5,121	5,000
Lignite do	7,476	[e] 7,800	[e] 8,300
Coke and semicoke:			
Metallurgical do	[e] 1,280	1,250	[e] 1,260
Gashouse do	[e] [r] 32	[e] [r] 32	[e] 68
Breeze do	[e] [r] 116	[e] [r] 110	72
Total do	1,428	1,392	[e] 1,400
Gas, natural:			
Gross production [e] million cubic feet	24,000	25,000	25,000
Marketed production [e] do	5,000	5,000	5,000
Petroleum:			
Crude thousand 42-gallon barrels	25,144	23,661	22,167

See footnotes at end of table.

Table 1.—Turkey: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline ----thousand 42-gallon barrels--	16,426	16,454	16,899
Jet fuel ----do----	1,927	2,855	2,080
Kerosine ----do----	4,466	3,999	3,204
Distillate fuel oil ----do----	23,053	23,658	23,503
Residual fuel oil ----do----	37,759	36,537	37,865
Lubricants ----do----	NA	257	511
Other:			
Liquefied petroleum gas ----do----	4,929	4,659	4,298
Naphtha ----do----	2,046	2,756	2,949
Petroleum asphalt ----do----	1,407	1,448	1,765
Unspecified ----do----	75	161	101
Refinery fuel and losses ----do----	3,483	1,896	3,167
Total ----do----	[4] 95,571	94,680	96,342

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 ores 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.

TRADE

Ending a long-standing controversy between British Petroleum Ltd. and Mobil Oil Turk A.S. on the import price of crude oil, the Turkish Government announced in April that it had reached a provisional equitable solution with the companies. The agreement reportedly gave British Petroleum and Mobil Oil Turk the rights to import 36° API crude oil at $10.50 per barrel on terms of a 3-month credit. The agreement also gave the companies the right once again to distribute their products in Turkey, and exploration rights were given to British Petroleum.

Turkey in 1975 reported a severe trade deficit of $3.3 billion. Imports, led by machinery ($1.3 billion), crude petroleum ($811 million), and iron and steel ($679 million), reached $4.7 billion, an increase of 25%, over the 1974 import bill. Exports during the same period fell 8.6%, to $1.4 billion.

Table 2.—Turkey: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Ore and concentrate ----	144,620	187,400	All to U.S.S.R.
Oxide and hydroxide ----	--	101,175	U.S.S.R. 101,125.
Metal:			
Scrap ----	100	--	
Unwrought ----	43,973	--	
Semimanufactures ----	4,870	21,446	U.S.S.R. 17,400; Kuwait 1,341.
Antimony ore and concentrate ----	5,069	13,174	United States 6,460; West Germany 5,100.
Arsenic, natural sulfides ----	3	--	
Copper including alloys:			
Unwrought ----	2,602	363	France 149; United Kingdom 126; Switzerland 69.
Semimanufactures ----	r 8	12,483	West Germany 4,437; Belgium-Luxembourg 2,335.
Chromium ore and concentrate ----	404,910	645,896	United States 159,828; Switzerland 103,495.
Iron and steel:			
Ore and concentrate, including roasted pyrite ----	5,372	--	
Metal:			
Ferroalloys ----	20,547	9,388	United States 2,900; Belgium-Luxembourg 2,290; Netherlands 1,762.

See footnotes at end of table.

Table 2.—Turkey: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Semimanufactures	r 27,521	686,450	West Germany 220,145; Japan 147,269.
Lead ore and concentrate	8,390	40,973	Italy 19,013; Bulgaria 11,499.
Manganese ore and concentrate	520	2,000	All to Spain.
Mercury .... 76-pound flasks	8,011	4,616	Pakistan 1,389; United Kingdom 1,378.
Molybdenum ore and concentrate	--	18	All to Sweden.
Tungsten ore and concentrate	--	9	All to United Kingdom.
Zinc:			
Ore and concentrate	26,010	54,746	Italy 27,405; Bulgaria 11,500.
Metal, semimanufactures	559	96	Switzerland 91.
Other:			
Ore and concentrate	8,970	1,500	All to Japan.
Ash and residue containing nonferrous metals	587	--	
Metals including alloys, all forms	169	545	Netherlands 271; Bulgaria 110; Poland 100.
NONMETALS			
Abrasives, natural, n.e.s	r 65,209	89,427	Netherlands 45,809; France 15,770; U.S.S.R. 15,000.
Barite	110,530	69,573	West Germany 36,226; U.S.S.R. 15,000.
Boron materials:			
Crude natural borates	355,124	664,461	Italy 129,890; France 109,565; Switzerland 95,755.
Oxide and acid	14,376	11,368	West Germany 2,704; United Kingdom 2,150.
Cement .... thousand tons	980	292	Syria 144; Libya 42.
Chalk	522	4,084	Libya 3,500.
Clays and clay products:			
Crude clays, n.e.s.:			
Bentonite	2,020	2,420	Iraq 1,520; Italy 900.
Fire clay	45	--	
Fuller's earth, chamotte	50	--	
Kaolin	5,927	13,285	Lebanon 13,275.
Other	17	--	
Products:			
Refractory	r 3,271	646	Iran 638.
Nonrefractory	5,674	1,480	West Germany 545; Netherlands 459; Libya 362.
Diatomite and other infusorial earth	2	12,348	All to Belgium-Luxembourg.
Gypsum	--	1,500	Libya 1,000; Lebanon 500.
Lime	4,568	11,127	All to Libya.
Magnesite:			
Crude	r 8,551	2,970	East Germany 1,800; Australia 1,150.
Calcined	73,444	89,949	Australia 58,400; Netherlands 12,051.
Pyrite (gross weight)	6,160	18,130	West Germany 16,130; U.S.S.R. 2,000.
Salt	23	--	
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked, calcareous	3,834	14,920	Lebanon 7,398; Italy 3,717.
Worked	16	19	Cyprus 16.
Dolomite	27	73	Iran 40; Greece 33.
Gravel and crushed rock	50	--	
Quartz and quartzite	16	--	
Sand, excluding metal bearing	1,000	--	
Sulfur, sulfuric acid	26,025	--	
Talc	66	125	Iran 80.
Other nonmetals, n.e.s.:			
Crude, meerschaum, amber, jet	8	3	West Germany 2.
Slag, dross and similar waste, not metal bearing	166	200	All to Belgium-Luxembourg.
Oxides and hydroxides of magnesium, strontium, barium	50	--	
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	1,529	24	All to Iran.
Unspecified	8,921	37,030	West Germany 10,750; Italy 8,350; Belgium-Luxembourg 5,750.

See footnote at end of table.

Table 2.—Turkey: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	50	--	
Coal, coke, briquets	600	300	All to Iraq.
Hydrogen, helium, and rare gases	11	13	All to Israel.
Petroleum:			
Refinery products:			
Gasoline thousand 42-gallon barrels	3,192	4,253	Sweden 1,285; United States 640; West Germany 595.
Kerosine and jet fuel do	r 749	1,492	Belgium-Luxembourg 319; Lebanon 278; Greece 234.
Distillate fuel oil do	1,257	254	Syria 139; Netherlands 115.
Residual fuel oil do	749	--	
Lubricants do	--	154	All to Libya.
Other do	840	171	Iran 119; Libya 52.
Mineral tar and other coal-, petroleum, or gas-derived crude chemicals	11,357	550	All to West Germany.

r Revised.

Table 3.—Turkey: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Oxide and hydroxide	1,892	451	U.S.S.R. 242; West Germany 132.
Metal:			
Unwrought	40,363	50,387	Switzerland 9,708; France 7,490; Norway 6,542.
Semimanufactures	r 6,712	2,400	France 779; West Germany 428; Switzerland 237.
Arsenic trioxide, pentoxide and acids	57	63	West Germany 25; France 20.
Cadmium metal including alloys, all forms	8	12	Netherlands 7; Belgium-Luxembourg 3.
Chromium oxide and hydroxide	201	132	West Germany 64; Italy 50.
Cobalt:			
Oxide and hydroxide	16	12	Mainly from Belgium-Luxembourg.
Metal including alloys, all forms	1	(1)	Mainly from United States.
Copper:			
Ore and concentrate	17,858	--	
Matte	399	--	
Metal:			
Scrap	456	10	West Germany 8; United States 2.
Unwrought	5,073	352	France 149; United Kingdom 125.
Semimanufactures	r 6,052	11,376	West Germany 4,437; Belgium-Luxembourg 2,335.
Iron and steel:			
Ore and concentrate thousand tons	301	310	Brazil 225; United States 62.
Metal:			
Scrap do	187	118	United States 81; Switzerland 32.
Pig iron, ferroalloys, and similar materials do	173	76	West Germany 30; U.S.S.R. 18.
Primary forms do	r 458	411	West Germany 121; Japan 70; Switzerland 66.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	141	493	West Germany 167; Switzerland 67.
Universals, plates, sheets do	r 171	472	West Germany 178; Japan 144.
Hoop and strip do	8	5	West Germany 1; France 1.
Rails and accessories do	6	62	France 29; Belgium-Luxembourg 13.
Wire do	3	7	Mainly from West Germany.
Tubes, pipes, fittings do	38	20	West Germany 5; Hungary 2; United States 2.
Castings and forgings do	1	2	Mainly from Italy.
Lead metal including alloys:			
Scrap	213	1,829	United States 1,009; Switzerland 717.
Unwrought	4,415	9,192	United Kingdom 5,850; West Germany 1,162.
Semimanufactures	17	648	Canada 451; Italy 109.

See footnotes at end of table.

Table 3.—Turkey: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Magnesium metal including alloys:			
Unwrought	41	229	Switzerland 199; West Germany 12.
Semimanufactures	(1)	1	Mainly from Sweden.
Manganese:			
Ore and concentrate	2,973	3,381	Belgium-Luxembourg 2,650; Greece 731.
Oxides	793	531	West Germany 290; Japan 100.
Metal	1	11	Mainly from Japan.
Nickel:			
Matte, speiss and similar materials	256	188	United Kingdom 93; Netherlands 70.
Semimanufactures	114	103	West Germany 48; United Kingdom 18.
Platinum-group metals and silver metal, including alloys:			
Platinum group troy ounces	8,359	3,279	United Kingdom 2,669.
Silver do	46,297	127,574	Mainly from West Germany.
Tin:			
Oxides	12	23	West Germany 22.
Metal including alloys, all forms	r 1,370	1,124	Switzerland 733; West Germany 147.
Titanium:			
Ore and concentrate	655	502	Netherlands 201; Switzerland 105; Australia 100.
Oxides	2,293	1,538	West Germany 385; United Kingdom 368; Czechoslovakia 281.
Zinc:			
Oxide	4,974	3,383	Netherlands 1,006; Lebanon 786; West Germany 675.
Metal including alloys:			
Unwrought	13,490	23,847	West Germany 14,195; Belgium-Luxembourg 3,029.
Semimanufactures	541	169	Yugoslavia 100.
Zirconium ore and concentrate	94	17	Australia 12; Switzerland 3.
Other:			
Ores and concentrates, n.e.s	30	--	
Ash and residue containing nonferrous metals, n.e.s	201	596	United States 348; United Kingdom 197.
Oxides, hydroxides, peroxides of metals, n.e.s	136	105	West Germany 42; France 21; Netherlands 15.
Alkali, alkaline earth, rare-earth metals	r 3	134	Bulgaria 130.
Base metals including alloys, all forms, n.e.s	r 6	18	Switzerland 9; France 5.
NONMETALS			
Abrasives, natural, n.e.s.:			
Crude	(1)	12	All from Netherlands.
Dust and powder of precious and semiprecious stones kilograms	4	5,006	Do.
Grinding and polishing wheels and stones	910	1,132	United Kingdom 170; Italy 157; West Germany 157.
Asbestos, crude	9,881	14,584	Canada 5,293; U.S.S.R. 4,993; Republic of South Africa 2,044.
Cement	1,412	612	West Germany 250; France 177; United States 167.
Clays and clay products:			
Crude clays, n.e.s.:			
Bentonite	148	26	Sweden 9; Belgium-Luxembourg 6.
Fuller's earth, chamotte	57	--	
Kaolin	37	2,599	United States 1,289; United Kingdom 1,278.
Other	r 474	440	Netherlands 183; United States 97.
Products:			
Refractory (including nonclay bricks)	63,681	37,829	Australia 11,106; United States 4,541.
Nonrefractory	596	1,631	West Germany 893; United Kingdom 303.
Diamond, industrial thousand carats	225	59	Netherlands 33; United Kingdom 25.
Diatomite and other infusorial earth	274	292	West Germany 204; Italy 42.
Feldspar	22	96	West Germany 70; Sweden 25.

See footnotes at end of table.

Table 3.—Turkey: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Fertilizer materials:			
Crude:			
Nitrogenous	19,756	(1)	All from West Germany.
Phosphatic	329,231	590,994	Morocco 280,414; Tunisia 171,257; Lebanon 52,646.
Manufactured:			
Nitrogenous	847,253	368,410	Italy 123,709; Netherlands 78,577; U.S.S.R. 64,078.
Phosphatic	62,395	10,298	Greece, 7,470; Lebanon 1,333.
Potassic	78	176	West Germany 125; Israel 50.
Other	800,444	421,901	France 94,997; Australia 92,714; Italy 78,087.
Fluorspar	1,176	654	West Germany 498; Switzerland 75.
Graphite, natural	522	517	West Germany 339; Australia 90.
Lime	80	80	All from West Germany.
Magnesite	189	5	France 3.
Mica:			
Crude	41	53	Sweden 32; West Germany 12.
Worked	24	29	Spain 18; West Germany 6.
Pigments, mineral	206	5,198	Cyprus 5,000.
Precious and semiprecious stones, except diamond, manufactured ----- kilograms	1,527	5,890	East Germany 5,645.
Pyrite (gross weight)	r 127,461	77,191	Cyprus 58,707; United Kingdom 18,484.
Salt	35	14	West Germany 11.
Sodium and potassium compounds:			
Caustic soda	r 24,866	21,625	Italy 17,713; West Germany 2,587.
Caustic potash	422	400	United Kingdom 150; France 137; Italy 101.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	3	6	All from West Germany.
Worked	--	1	Do.
Dolomite	27	2	All from Sweden.
Gravel and crushed rock	2,358	178	Denmark 90; France 80.
Quartz and quartzite	368	394	West Germany 168; Netherlands 101.
Sand, excluding metal bearing	11	11	All from Belgium-Luxembourg.
Sulfur:			
Elemental:			
Other than colloidal	26,260	210	Mainly from Switzerland.
Colloidal	92	131	France 93; West Germany 33.
Sulfuric acid	12,730	129,407	Switzerland 129,398.
Talc	390	549	Italy 497; France 25.
Other nonmetals, n.e.s.:			
Crude	21	43	Canada 20; Sweden 17.
Oxides and hydroxides of magnesium, strontium, barium	141	113	Italy 28; West Germany 21; Belgium-Luxembourg 20.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	1,184	87	U.S.S.R. 68.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	2,534	69	United Kingdom 45; United States 15.
Carbon black	16,433	16,919	Italy 12,967; United Kingdom 778; Israel 699.
Coal and coke, including briquets	23,926	163,474	Italy 119,653; Poland 37,554.
Petroleum:			
Crude and partly refined thousand 24-gallon barrels	r 56,052	74,936	Iraq 34,482; Saudi Arabia 28,183.
Refinery products:			
Gasoline ---- do	47	49	Mainly from Italy.
Kerosine and jet fuel ---- do	21	1	Mainly from Netherlands.
Distillate fuel oil ---- do	(1)	--	
Residual fuel oil ---- do	744	1,918	Canada 709; Venezuela 374.
Lubricants ---- do	985	938	United Kingdom 291; Netherlands 231.
Other:			
Liquefied petroleum gas ---- do	58	550	Italy 426; France 79; Libya 45.
Mineral jelly and wax ---- do	34	32	West Germany 15; Romania 5.
Unspecified ---- do	17	46	U.S.S.R. 35.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	813	1,376	Netherlands 676; Belgium-Luxembourg 651.

r Revised.
[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—Turkish bauxite deposits, located mainly in the Taurus mountains, were estimated to contain 400 million tons of 46% Al_2O_3 reserves. Only the Konya-Seydisehir deposit was in active production during 1975 while the Gaziantep-Islahiye, Hatay-Iskenderun, and Isparta deposits remained dormant. Bauxite production for 1975 was 14% below that of 1974 while aluminum production was the highest recorded for Turkey.

Seydisehir Integrated Aluminum plant (SIA) operated below capacity during the year due to the energy shortage. The cost of the Soviet financed plant, operated by Etibank, had tripled since the 1960 estimates. Also the plant suffered from slow deliveries of equipment, construction difficulties, and sharply increased prices on caustic soda and petroleum coke.

Antimony.—The antimony deposits of Turkey with estimated total reserves of 900,000 tons are found in four districts. Only the Tokat-Turhal District deposits were mined in 1975. The reported proven reserves were 124,000 tons with an antimony content ranging between 11% and 13%. Proven antimony reserves of the other three districts were as follows: Katahya-Simva 300,000 tons of 4% to 5% Sb; Balikesir 305,000 tons of 5% to 6% Sb, and Nidge-Grumusler 100,000 tons of 5% Sb content. Production of antimony in Turkey decreased 39% in 1975 compared with 1974 output.

Chromite.—Chromite ore production reached a new historical high in 1975 due to high prices and market demand. A total of about 941,000 tons of run of mine ore was produced during the year, of which 648,000 tons were from private mines and the remaining from State-owned Etibank mines. Etibank's Antalya ferrochrome plant produced at full capacity, 10,000 tons for the year. Some was used domestically and the remainder was exported to Western European steel mills. Establishment of a ferrochrome plant near Mardin in Elâzig Province with the technical and financial assistance of Metals and Chemicals Co. of Japan proceeded on schedule in 1975. Etibank, the sole owner of the Elâzig ferrochrome plant, expected high-carbon ferrochrome production to begin in 1977. At full-capacity production, the Elâzig plant would produce 50,000 tons of ferrochrome per year.

Copper.—The worldwide slump in copper prices affected both the private and public sectors copper production which showed a 9% decrease in 1975 output. Karadeniz Bakir Isletmeleri A.S. (KBI), (the Black Sea Copper Company), at Samsun, owned 49% by Etibank and the remainder by private Turkish banks, did not achieve its full capacity. When fully operational the Samsun flash copper smelter was to produce 41,000 tons of blister copper, 365,000 tons of sulfuric acid, 11,000 troy ounces of gold, and 210,000 troy ounces of silver per year. The complex was equipped with a 8,000-ton-per-day capacity slag cleaning plant.

Proven ore reserves in some of the copper bearing deposits were as follows: Ergani, copper-pyrite ore, 12 million tons; Cakmakkaya, copper-pyrite ore, 98 million tons; Damar, copper-pyrite ore, 92 million tons; Lahanos, copper-pyrite-zinc ore, 12 million tons; Cayeli, copper-pyrite-zinc ore, 25 million tons; Kure, copper ore, about 2 million; and Madenkoy, copper ore, 15 million tons.

Iron Ore.—Iron ore production in 1975 was 2.2 million tons, a decrease of 1.2% compared with that of 1974. Approximately 1.3 million tons of the total output was from the State-owned Divrigi mine in Central Turkey. Due to inflation, the cost of the iron ore concentrator and pelletization plant was increased from an estimated \$26 million in 1970 to \$138 million in 1975 as the feasibility study had indicated. The 2-million-ton-per-year roasting plant and 1.6-million-ton pelletizing plant were expected to be completed by 1976. Energy requirements at the mine and pelletizing plant were to be met by a new 180-megawatt thermal powerplant to be erected at Kangal. The thermal plant was to utilize lignite from a newly discovered 150-million-ton deposit in Sivas Province.

Feasibility studies continued on the Hassan Celebi iron ore deposits, which contained an estimated 306 million tons of iron ore with grades ranging from 28% to 48% iron.

Iron and Steel.—Crude steel production, including castings and pig iron, increased 13% in 1975 compared with that of 1974. A third Turkish iron and steel plant at Iskenderun, financed by the U.S.S.R., was officially inaugurated in 1975 in the presence of Soviet officials. The plant was expected to produce 2 million tons of steel per year when in full production. However, the management announced that new agreements with the Soviet Union had been reached to increase production capacity 50%. In 1975, the plant employed 14,000 workers and produced 200,000 tons of pig iron.

Colakoglu Metalurgi Co. installed a concast three-strand continuous billet caster in August. The machine was able to cast billets of 75 to 130 square millimeters. A similar concast machine was due to go into production in 1976 at Electrofer Celik Sanayii. Meanwhile, a Demag single-strand billet caster, delivered to Elektro Metal Sanayii in 1971, was due to go in full operation by 1976. This machine, with a capacity of 30,000 tons per year, could produce billets 80, 100 and 120 square millimeters in a variety of grades including spring, stainless, and tool steels. A concast slab caster was also in the process of being installed at the Eregli steel mill with an expected date of production in 1976.

A fourth integrated steelworks was planned for construction at Elâzig. The project was supported by Makina Va Kimya Endüstrisi Kurumu the State-owned machinery and chemical concern which already operated a steel plant at Kirikkale. No information was available on the financing or shareholders by the end of 1975.

Lead and Zinc.—Cinku-Kurusum Metal Sannayii of Turkey (CINKUR) continued mining in the Zamanti Valley and created stockpiles for further processing. The zinc smelter, owned 47% by Etibank and the remainder by private investors, was not completed at yearend 1975. However, trial runs were made and mid-1976 was given as the full production date. The CINKUR smelter was to process 238,000 tons of mined lead-zinc ore per year and was to produce 40,000 tons of zinc and zinc products. Production of lead and zinc in 1975 was 17% less than 1974 output.

Manganese.—Because of higher demand for manganese in international markets during 1975, Turkish manganese producers, in both the private and public sectors, produced about 34,000 tons of manganese ore, a 10-fold increase compared with 1974 output. Most of the manganese produced was metallurgical grade ore, which was consumed locally or exported to Western Europe.

Mercury.—Etibank's Sizma and Holikoy mercury mines in southwestern Turkey produced about 93,000 tons of ore, 39% below that of 1974. However, intense mapping and geochemical prospecting continued at Etibank's newly acquired 1,000-hectar Bolali concession in Usak Province. By yearend no progress reports were available.

Mercury consumption in the industrialized nations was sharply down in 1975 following reports of mercury pollution. Turkish representatives participated in a conference held in Geneva, Switzerland, to solve the problem of severe price drops of mercury on the international market by prorating production and exchanging data.

Tungsten.—Total reserves of Turkish tungsten deposits were reported to be about 15 million tons; Bursa-Uludag estimated at 14.5 million tons with 0.3% WO_3 and Elâzig-Keban District 0.5 million tons with 0.5% WO_3. Etibank, the sole owner of the Bursa-Uludag deposit, continued mine development and construction of a concentrator in the foot hills of Uludag during the year. Delays, caused by a fire and slow equipment delivery, postponed the production date from 1976 to early 1977. The concentrator was designed to treat sheelite, the typical ore of the Uludag deposit, at a rate of 560,000 tons per year. Reportedly, the estimated cost of the entire project earmarked at $26 million in 1974 was to increase because of worldwide inflation.

Uranium.—MTA's uranium and thorium exploration program continued during the year. The construction of a small pilot plant to process and enrich uranium ore found in western Turkey continued. Etibank, the owner of the plant, expected partial production in 1976. Other details on the operation were not available.

NONMETALS

Asbestos.—Production of asbestos, mostly chrysotile, remained about 16,000 tons in

1975. Turkish exports of asbestos in recent years have been nil because most of the asbestos production was consumed locally. In 1975, Amyan Sanayii A.S., which owned the concession rights at Mihaliceik, East Eskisehir, announced a tentative plan to build a plant with a 10,000-ton-per-year capacity by 1977, and to further expand the plant eventually to a 30,000-ton-per-year capacity. The plant was to process ore for both the local and export markets.

Barite.—Turkish barite deposits, with estimated total reserves of about 10 million tons, were located at Kahraman, Maras, Aksehir, Sarkikaraagac, Alanya, and Tavsanli. However, Barit Maden Turk A.S. (BMT) was the sole producer of barite in 1975. A new decision by the Government of Turkey required all barite producers to export their product in packaged ground form after yearend 1976. During 1975, until the grinding facilities were installed at the mine, BMT could export only 75% of its product in lump form.

Production of barite decreased 78% in 1975, partially because of governmental restriction and partially because of lower world demand and acute competition.

Boron.—Published figures indicated that total reserves of boron minerals in Turkey were about 490 million tons, which constituted more than 50% of world reserves. However, Turkey produced less than 20% of world boron supplies in 1975. Etibank, the State-owned banking and mining organization, mined and processed most of Turkey's boron mineral and derivatives, while private companies controlled the small remainder. Construction of Etibank's processing plant, which was to produce 180,000 tons of pentahydrate borax, 60,000 tons of anhydrous borax, and 17,000 tons of dehydrate borax per year, continued during the year. Furthermore, Etibank announced the construction of a second boric acid plant with a 100,000-ton-per-year capacity, a second sodium perborate plant with a 20,000-ton-per-year capacity, an alpha-hemihydrate plant with a 25,000-ton-per-year capacity, and a hydrogen peroxide plant with a 20,000-ton-per-year capacity to be completed by 1978. The estimated cost of these new installations was not available by yearend 1975.

Cement.—Cement production in Turkey showed a substantial increase in 1975, reaching a new high of 10.8 million tons compared with 8.9 million tons in 1974. The production increase was in line with predictions made in the 5-year plan. The European Investment Bank (EIB) provided a loan of $7.7 million for the construction of a cement mill at Yozgat, Central Anatolia. The capacity of the Yozgat cement plant was to be 500,000 tons per year of portland cement beginning in 1977. The project was to cost $25 million and was established by Yozgat Isci ve Sanayii A.S., a joint stock company especially formed in 1973 to provide a means by which Turkish workers employed abroad could channel their savings into production investments. In 1975 there were about 7,000 shareholders and these were expected to increase to 10,000.

Fertilizer Materials.—Etibank proposed a major capital investment project for the Karatas phosphate deposit in 1975. The project would require a total investment of $6.5 million of which about $1 million would be for equipment to be purchased abroad, and the remainder for development, mining, and extraction at the mine site. A major extension of Azot Sanayii's fertilizer complex at Samsun was commissioned, which made this installation the largest phosphate fertilizer complex in the country. Supplied and constructed by Davy Powergas of West Germany, production capacity of the complex was 1,450 tons of fertilizer per day. The plant employed Olin/Chemiebau technology and was to use Moroccan and Tunisian phosphate rock. By yearend 1975, total Turkish phosphate fertilizer production reached 200,000 tons, and during 1975, 110,000 tons was imported.

Magnesite.—The major magnesite deposits with a reported 17 million tons total reserves were located in Eskisehir, Konya, Denezli, Sivas, Erzincan, Kütahya, Mugla, and Bursa. Magnesite Anonim Sirketi Magnent Ltd., the most important producer, exported 45,000 tons of dead burnt magnesite in 1975. Total magnesite production by various companies was about 459,000 tons which was 12% less than the 1974 output. It was announced that Turkey's annual refractory brick requirements were 53,000 tons in 1973 and were to increase to 142,000 tons by 1985. The refractory brick plant at Konya, operated by the Government, was expanded to a 33,000-ton capacity.

Perlite.—Perlite production was estimated at 11,000 tons, a decrease of about 41% in 1975 compared with that of 1974. Turkey, a newcomer to the international perlite market, was not able to increase its exports, due to stiff competition in prices as well as in transportation. However, perlite producers were optimistic about the future export trade in perlite and their penetration into the market.

Pyrite.—Cupreous pyrite production decreased 69% compared with that of 1974. The decrease was attributed to sluggish copper markets in the Western World and decreased activities in copper production in Turkey. West Germany remained, as in the previous year, the main importer of Turkish pyrite, in exchange for processing it on a barter-like basis.

Salt.—Because of increased domestic consumption and exports of salt, principally to Cyprus, salt production reached a new high of nearly 740,000 tons in 1975. Most of the salt came from the rock salt mines in Anatolya, where some good-quality deposits had been reported. One of the major areas for rock salt consumption was in the tanning industry, where Turkey led among most of the Middle Eastern countries.

MINERAL FUELS

The new Iraq-Turkey petroleum pipeline, which was to give Iraq a new market and security in transit, was almost finished in 1975. The 640-kilometer, 40-inch pipeline from the Kirkuk Field complex in Iraq to the Turkish Iskenderun Bay on the Mediterranean was to be completed by yearend 1976. The pipeline, which was built by Mannesmann-Export Co. of West Germany, was to have an initial capacity of 500,000 barrels per day with an expected peak capacity of up to 700,000 barrels per day. Turkey was to buy 200,000 barrels daily of Iraqi crude from 1977 through 1979, with an option to expand the Turkish offtake to 280,000 barrels per day when the pipeline capacity expands. Iraqi petroleum authorities agreed to pay Turkey a transit fee of 35¢ per barrel for a 20-year period, starting with the transmission of crude.

The Iraq-Turkey pipeline was to extend 341 kilometers from the Kirkuk Field to the Turkish border, and 640 kilometers through Turkey from east to west, crossing the Tigris and Euphrates Rivers to the Mediterranean coast. Turkey was to pay $300 million of the expected $435 million total cost of the project. Feasibility studies on a 2-billion-cubic-feet-per day natural gas pipeline to transport Iraqi natural gas to Istanbul, Turkey, and possibly on to either Europe or the Soviet Union continued and no decision was made by yearend.

According to Türkiye Elekterik Energisi Tüketim Tahminleri, the first nuclear powerplant to produce electricity in Turkey was expected to start operating by 1985. Construction of the plant at Eregli by the Sea of Marmara began in 1975 but the heavy construction was hampered by foundation problems.

Coal.—The Afsin Elbistan lignite project, including an opencast lignite mine and a thermal powerplant, experienced financial difficulties during the year. Reportedly, details of the terms of financing had to be worked out between the World Bank and Türkiye Elektrik Karumu Genel Müdürlugu (TEK), (Turkish Electric Power Directorate General). The cost of the entire project was estimated at $500 million. Mining responsibilities were to be with the Türkiye Komur Isletmeleri (TKI), (Turkish Coal Works). The Elbistan lignite deposit was estimated to contain about 3 billion tons of lignite. TKI planned to mine 20 million tons of lignite annually of which 17.5 million tons were to be used in the power generation plant and 2.5 million tons for other domestic fuel requirements. Initial production of lignite was scheduled for 1978. The powerplant was designed to have four 300-million-watt units with other basic accessories.

Bituminous coal production by both private and the public sectors decreased 2% in 1975 compared with 1974 output, while lignite production in both sectors increased 6% in 1975. Although coke production registered a slight increase, Turkey was obliged to import coke for its growing steel industry from abroad and apparently was to do so in the coming years. Türkiye Demir ve Celik Isletmeleri, the Turkish iron and steel industry, proposed that the Iskenderun steel mill would have to import 1.2 million tons of metallurgical-grade coking coal for its operation in 1977.

Consumption information on bituminous

and lignite coal and coke was not available; however, it is thought that sale figures gave a good indication of domestic consumption. In the following tabulation, data on production and sales for 1974 and 1975 are given in thousand tons:

	Production		Sales	
	1974	1975	1974	1975
Bituminous coal	8,511	8,109	4,708	4,594
Lignite [1]	7,666	8,433	7,600	8,200
Coke	1,214	1,242	640	438

[1] Data do not agree with that shown on table 1 because of difference in source: Turkiye Komur Isletmeleri Kurumu.

Petroleum.—Türkiye Petrolleri A.O. (TPAO), a State-owned Turkish petroleum company, was evaluating the results of seismic and magnetic surveys carried out early in 1975. Reportedly, on the basis of this evaluation TPAO was to spot some wells in the Turgut and Bolgi areas in 1976. TPAO also made a seismic, gravity, and magnetic survey over 5,318 square kilometers in the Mediterranean offshore area during the year. A similar survey with an international group was planned for 6,000 square kilometers of the eastern Mediterranean during the 1976 exploration season.

A group of five companies headed by Marathon spudded a well in the Sea of Marmara. However, after drilling to a depth of about 7,500 feet, the well was abandoned and by yearend 1975 Marathon had surrendered to the Turkish authorities its entire block of eight exploration licenses in the area.

TPAO's research vessel *Sisimik* carried on preliminary exploration work in the Mediterranean during the year. However, actual offshore drilling was postponed because of still unsolved problems between Greece and Turkey. By yearend both countries were hopeful that, by putting the whole problem before the International Court at The Hague, some workable solution acceptable to both parties might be worked out.

During 1975, Turkey obtained 73% of its petroleum imports from Iraq, 15% from Libya, and the remainder from Saudi Arabia, Egypt, and other countries.

Badger Turkey Ltd. was awarded the contract for the refinery expansion of Istanbul Petroleum Refining Co. (IPRAS), a wholly-owned subsidiary of TPAO. The $70-million project was to increase capacity of the refinery at Yarimca, near Izmit to 13 million tons per year. Atmospheric crude distillation, naphtha reforming, kerosine, diesel, desulfurization, and other units were to be added to the refinery by yearend 1976.

Turkish imports and exports of crude petroleum and refinery products, in thousand tons, for the year 1975 are given in the following tabulation:

	Imports	Exports
Crude petroleum	9,600	--
Naphthalene	--	88
Supergasoline	--	143
Regular gasoline	--	117
Jet fuel	--	95
Diesel oil	103	11
Fuel oil No. 6	292	--
Liquefied petroleum gas	149	--
Lubricants	77	--
Paraffin and others	6	--

The Mineral Industry of the U.S.S.R.[1]

By V. V. Strishkov [2]

The U.S.S.R.'s completely nationalized economy maintained its position as the world's second largest producer of industrial products in 1975. In the Soviet Union, 1975 marked the end of the ninth 5-year plan for 1971–75. The following production increases, compared with 1974, have been reported, in million tons: Raw coal and lignite, 16.9; oil (including condensate), 32.1; iron ore, 8.0; pig iron, 3.1; crude steel, 5.0; finished rolled ferrous metals, 4.3; steel pipe, 1.0; mineral fertilizers, 2.6 (100% content); and cement, 6.8. Electric power output increased 62,200 million kilowatt-hours. Output of many nonferrous, rare, and precious metals, oil refinery and petroleum products, and nonmetallic minerals was higher than in 1974. In 1975, the annual plan for production of some mineral commodities was met, but for iron ore, pig iron, raw steel, rolled ferrous metals, aluminum, gold, copper, nickel, and other metals, production failed to meet even the reduced growth rate set for 1975.

The U.S.S.R. is the world's leading producer of petroleum, raw steel, iron ore, manganese ore, chromium, potassium salts, phosphates, and cement. It holds second place in the production of gold, platinum-group metals, aluminum, natural gas, and fluorite, and it is one of the leaders in the output of copper, nickel, lead, zinc, tungsten, molybdenum, mercury, and native sulfur.

Despite impressive gains in mineral production, as reported in the Soviet press, the efficiency of planning and production has left much to be desired, judging from consistent reports of the failure of output of mineral commodities to reach planned goals and to supply industrial needs. New goals were planned for the 1971–75 period, with efforts directed chiefly to fulfilling quantitative targets in the mineral commodities; a considerable part of industrial output did not meet Soviet standards of quality.

The U.S.S.R. Ministry of Ferrous Metallurgy was unable to fulfill the 1975 plan for production of many types of products, but the gross index in tonnage and value in rubles was fulfilled. Consuming plants, construction projects, transportation, industry, and agriculture did not receive many of the particular products ordered. Insufficient production of high-quality special steel required for such items as aircraft, nuclear reactors, and tubing and the shortage of many shapes of ferrous rolled products compelled the machine building industry to resort to the use of expedients. This was reflected in the quality of machines and led to excessive use of metal, a significant part of which was transformed into shavings.[3] The U.S.S.R. imported ordinary steel sections, steel pipe, and special steel from Japan and various Western countries.

With a total population of 255.5 million in January 1976, the Soviet economy (excluding agriculture) employed 102.2 million workers and employees. From 1955 to 1974 the number of women workers and employees more than doubled, and in 1974 it comprised 51.2 million. The number of women working in industry increased at a faster rate than the number of men. This resulted in the growth of the share of women working in industry from 45% in

[1] This publication is based on a review of the sources published by the U.S.S.R.
[2] Physical scientist, International Data and Analysis.
[3] Izvestiya, Moscow. June 26, 1975.
Pravda, Moscow. Sept. 24, 1975, p. 1.

1960 to 49% in 1974.[4] The average length of service of the Soviet woman as a worker, employee, or collective farmer increased from 28.7 years in the sixties to 35.5 years in the seventies.[5]

The Soviet ferrous and nonferrous industries employed over 3 million workers;[6] 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 about 2.2 million employees in the coal industry, including 61,500 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.[7] Crude oil extraction occupied about 740,000 persons.[8] As a whole, according to Soviet sources, 69% of the graduate Soviet engineers performed various kinds of work not requiring specialized university training. For example, in the Ukrainian coal industry, about 1,000 graduate engineers and more than 16,000 graduate technicians were employed as workers in 1975. The work week in the U.S.S.R. was 41 hours for standard workers and 36 hours for underground miners.

Based upon published reports, it may be concluded that the expansion in the Soviet mineral industry continued to be achieved mainly through increased labor and capital rather than advancing technology. Evident shortages of mineral commodities were offset by efforts directed chiefly toward fulfilling quantitative goals, while less attention was paid to quality. The productivity of labor and equipment continued to be below planned levels. More than one-half of the machinery employed in the mineral industry was idle, owing largely to the quality of machines and the unsatisfactory supply of spare parts and materials at the mines and plants.[9] Much of the equipment used in the Soviet mineral industry is standardized and of a type now obsolete in West Europe and the United States. The manufacture of mining equipment has increased substantially, but the technical standards and quality of the equipment have fallen short of planned goals.

The Soviets are faced with enormous difficulties in trying to build a rational automated management system. One fundamental problem has been the absence of commensurate incentives. Prices are fixed and essentially the same throughout the country. Wages similarly are rigid and do not always reflect the worker's value on the job. In Western terms, prices reflect production costs or capital costs to a significant degree. Under these conditions, the difficulties of applying automated management systems are compounded.

At many mines and plants, up to one-half of the production workers were employed in manual labor, including surface loading and unloading. At polymetal mines in Kazakhstan, the proportion of mechanized labor did not exceed 34%, with the majority of auxiliary operations performed manually. In underground coal mining, over 50% of the workers were employed on nonmechanized tasks. Some 50% to 65% of the workers were engaged in ancillary jobs in all branches of the Soviet mineral industry in 1975.[10]

The turnover of personnel in individual mineral industry operations ranged from 25% to 80% per year. This was caused mainly by the delays in building houses and in providing public and medical services, by low material incentives, and by heavy manual work and unsafe working conditions.[11] At certain mineral industry operations, especially in the eastern regions of the country,[12] there were insufficient workers. To ease the shortage of labor, many employees were permitted to hold more than one job, and able-bodied pen-

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[4] Sotsialisticheskiy trud (Socialist Labor), Moscow. No. 9, September 1975, pp. 7–16.

[5] Vestnik statistiki (Herald of Statistics), Moscow. No. 8, August 1975, pp. 9–15.

[6] Metallurg (Metallurgist), Moscow. No. 7, July 1974, p. 1.

[7] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 6, February 1975, p. 1; No. 34, August 1976, p. 13.
Planovoye khozyaystvo (Planned Economy), Moscow. No. 1, January 1974, p. 32.
Trud (Labor), Moscow. July 15, 1973, p. 1.

[8] Ekonomika neftyanoy promyshlennosti (Economics of Petroleum Industry), Moscow. No. 7, July 1975, p. 3.

[9] Sotsialisticheskaya industriya (Socialist Industry), Moscow. May 21, 1975, p. 2.
Sovetskiy shakhter (Soviet Miner), Moscow. No. 6, June 1975, pp. 12, 21.
Ugol' Ukrainy (Coal of the Ukraine), Donetsk. No. 8, August 1975, p. 51.

[10] Bezopasnost' truda v promyshlennosti (Labor Safety in Industry), Moscow. No. 4, April 1975, p. 8.
Sotsialisticheskaya industriya (Socialist Industry), Moscow. June 24, 1975, p. 2.

[11] Sovetskaya Rossiya (Soviet Russia), Moscow. September 1974, p. 2.
Stroitel'naya gazeta (Construction Gazette), Moscow. Feb. 28, 1975, p. 3.

[12] Sovetskiy voin (Soviet Warrior). Moscow. No. 19, October 1975, pp. 21–22.

sioners were encouraged to supplement their incomes by returning to active employment.

The output quota-bonus principle, once condemned as an exploitation of the worker, has become an important feature of the mining industry. Soviet labor legislation requires that workers achieve a minimum output within a given period. This minimum is the work norm and is established for virtually every phase of employment. In connection with a significant increase in output quotas at enterprises, there was a substantial increase in the share of workers who did not meet the new quotas established during the last 2 years. For some mineral industry enterprises it amounted to 15% and more in 1975.[13]

Although the trade unions in Western countries are principally wage-bargaining organizations, their Soviet counterparts function largely as an avenue for increasing labor productivity and fulfilling planned quotas. The unions operate the insurance system and also work with management on safety. Practically every worker, including the entire management team, belongs to the union.

While the U.S.S.R. does not publish comprehensive data on injuries in the mineral industry, available Soviet information and Western mining engineering experience indicate that fatality rates are significant. In 1974 fatal injuries occurred at 48% of the Soviet coal mines and at 3% of the metal mines.[14] For many years, the largest number of accidents occurred at production and development faces as a result of roof collapse. Accidents caused by roof falls were the result of inadequate support, mainly due to prop shortages. Accidents at metallurgical plants have been caused mainly by the low level of equipment repair and by violation of technological processes.[15]

The administration of Soviet coal mines, with the approval of trade unions, has often used overtime work to fulfill the planned quota of coal production, has sometimes required workers to work two shifts in succession, and has even required underground miners to work an 8-hour shift instead of a 6-hour shift, in direct violation of the labor law.[16]

The concentration of airborne dust at workplaces in underground mines of the Soviet Union is high and often exceeds the industrial health standard.[17] Sanitary facilities such as toilets, locker rooms, showers, and drinking water are few and considerably below the Soviet official standard. There were especially unsatisfactory conditions at the Kuznetsk metallurgical complex, at the Zhdanov coke plant, at the Belov zinc plant, and at the enterprises of the Northeastern gold administration.[18]

Soviet statistical agencies do not publish data on the actual earnings of workers in the mineral industry. The average monthly earnings of Soviet workers and employees in 1975 was 146 rubles,[19] compared with 141 rubles in 1974, an increase of 3.5%. In 1975 the raising of the monthly minimum wage from 60 rubles to 70 rubles continued in the North and Soviet Far East and in some European regions of the U.S.S.R.

Soviet total goods transported in 1975 and planned for 1980, by mode of transport, follow:

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[13] Voprosy ekonomiki (Problems of Economics), Moscow. No. 10, October 1975, p. 9.

[14] Bezopasnost' truda v promyshlennosti (Labor Safety in Industry), Moscow. No. 4, April 1975, p. 3; No. 5, May 1975, pp. 4, 10, 16: No. 8, August 1975, pp. 7, 19.

Page 2 of second work cited in footnote 9.

[15] Second work cited in footnote 3.

[16] Page 3 of second work cited in footnote 9.

[17] Sovetskiy shakhter (Soviet Miner), Moscow. No. 7, July 1973, p. 57.

[18] Metallurg (Metallurgist), Moscow. No. 8, August 1975, p. 4.

[19] Official exchange rate is 1 ruble=US$1.32 (January 1, 1976). 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. According to Soviet sources the actual value of the U.S. dollar is 3 times higher than the official exchange rate.

	1975 (actual)		1980 (planned)	
	Goods transported (million tons per kilometer)	Percent of total	Goods transported (million tons per kilometer)	Percent of total
Rail	3,200,000	61.0	4,000,000	58.1
Water	1,000,000	19.1	1,300,000	18.9
Motor	388,000	7.4	480,000	7.0
Pipeline	656,000	12.5	1,100,000	16.0
Total	5,244,000	100.0	6,880,000	100.0

Source: Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 4, January 1976, p. 1.

About two-thirds of the total tonnage of mineral industry products moved in the U.S.S.R. in 1975 was shipped by rail. The average distance of railroad deliveries in kilometers in 1975 was:[20] Coal and lignite, 698; crude oil and petroleum products, 1,242; iron and manganese ores, 715; nonferrous ores, 895; ferrous metals, 1,413; and mineral fertilizers, 1,059.

In many sectors of the economy, more fuels and metals were consumed per unit of production than is required with modern technology. Soviet machines, as a rule, are lower in quality and productivity but higher in weight. For example, oxygen converters with a capacity of 100 tons, manufactured by the Zhdanov Heavy Machine Building Plant, are 200 tons heavier than similar converters produced by Western firms.[21]

Although the available losses of mineral commodities are not known completely and have not been adequately quantified, estimates have been reported widely in the Soviet press. A careful study of Soviet publications shows, for example, that only about 45% of the total raw steel production is efficiently used in the Soviet economy; 55% is remelted or lost as a result of low technology in the iron and steel industry.

The U.S.S.R. Ministry of Power Machine Building was organized in 1975. The ministry will have responsibility for construction of machinery and equipment for nuclear and thermal powerplants. The ministry will also be concerned with the transfer of technology for power stations.

Government Policies and Programs.—Soviet mineral policy continues to be based on the principle of maximum self-sufficiency. With State-owned and State-operated enterprises, low-wage labor, and low consumption, the U.S.S.R. has become the most self-sufficient of the world's leading industrial nations. In the Soviet economy, the selling price of a given commodity may be set at any reasonable level to yield the desired overall results; thus some mineral ventures in the Soviet Union might well be uneconomic by Western standards. Mineral development, as the basis of industrial growth, holds a key place in the Soviet economic policy. Very large sums are spent on mineral exploration and production, and the funds are distributed over a dozen specialized ministries.

The balancing of the Soviet economy is not possible in a pattern associated with a Western-style economy and can only be achieved by Government intervention or control through subsidies and similar measures. The U.S.S.R.'s 5-year plan and the year-to-year plans set a definite program for all mineral and energy resources. In addition to the national priorities and goals set for each industry, the plan is also law and carries mandatory obligations.

Considerable attention was being devoted to economic integration and industrial cooperation of the COMECON countries,[22] which makes East Europe, Mongolia, and Cuba more dependent upon the Soviet mineral industry. A program for economic integration over the next 15 to 20 years was adopted by the 25th Session of COMECON, which was held in Bucharest in July 1971. The eight COMECON nations regard the coordination of 5-year plans as one of the basic methods of planned cooperative development. Since 1949, the aims of COMECON have been

[20] Zheleznodorozhnyy transport (Railroad Transportation), Moscow. No. 3, March 1976, p. 35.

[21] Ekonomika Sovetskoy Ukrainy (Economics of the Soviet Ukraine), Kiev. No. 9, September 1975, pp. 11–16.

[22] COMECON—Council for Mutual Economic Assistance (CMEA) comprising the following countries: Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.

to increase the economic growth of member countries.

The 29th Session of COMECON held in Budapest in June 1975 concentrated primarily on closer integration of economic plans for the 1976–80 period and the specialization of industrial production. The Plan for Multilateral Integration Measures for the COMECON countries incorporates, among other Soviet projects, the joint construction and financing of the Kiyembay asbestos complex, the Orenburg gas condensate field, the gas pipeline from Orenburg to the Soviet Western border, the 750-kilovolt transmission line from Vinnitsa to the Hungarian border, and new facilities for iron ore mining and petroleum refining elsewhere in the Soviet Union. Reportedly, the total investment in joint projects involves about 9 billion transferrable rubles by participating COMECON countries with repayment in raw materials produced (asbestos, iron ore, natural gas, petroleum, and electric power).

The Kiyembay complex is to produce 500,000 tons of asbestos annually. The completion of enterprises for production of ferroalloys and processing of raw materials containing iron should make it possible for the U.S.S.R. to increase the deliveries of iron and iron ore 25% in 1980 over the 1975 level. When the Orenburg natural gas pipeline is put into operation, deliveries of Soviet natural gas to COMECON countries are to amount to 15,500 million cubic meters annually.

Actual and estimated consumption of fuel and power in COMECON European countries to the year 2000 is given in table 1.

According to COMECON agreements on economic integration, intra-COMECON trade is expected by 1980 to increase about 75% over that of 1975. The structure of Soviet exports to COMECON countries is "not entirely satisfactory." Although the Soviet Union is the greatest industrial power in the "socialist camp," its imports of machinery and equipment from COMECON countries are twice its exports to them.[23]

Under the long-range plan, there is to be progressively more integration of COMECON country plans, with an expected reduction of national independence. The management of economic assistance among COMECON nations is facilitated through the International Bank for Economic Co-operation and the International Investments Bank, a Soviet institution, which financed 39 projects. Of the funds allocated so far, 40% have been used in the metallurgical industry, 37% in engineering, and 11% in the chemical industry.

Yugoslavia is not a member of COMECON, although a 1964 agreement laid the foundation for Yugoslav participation. (It has observer status in half of COMECON's 24 commissions.) A protocol for the continuation of Soviet-Yugoslav economic and technical cooperation in 1976–80 was signed in July 1975. Both North Vietnam and North Korea also have observer status in the COMECON commissions.

At its 27th session, the COMECON Assembly ratified the agreement concluded in May 1973 for cooperation with Finland. In 1975, the initial cooperation agreements were concluded between COMECON and the developing countries Iraq and Mexico.[24] According to Soviet sources, Argentina and Colombia also intend to

[23] Novoye vremya (New Time), Moscow. No. 6, June 1975.
[24] Rabotnichesko Delo, Sofiya. Dec. 28, 1975, p. 5 (in Bulgarian).
Pravda, Moscow. Aug. 13, 1975.

Table 1.—U.S.S.R.: Consumption of primary energy in COMECON European countries

(Million tons of standard coal equivalent [1])

	1970	1975	1980	2000
Bulgaria	27	41	55	110
Czechoslovakia	87	103	121	235
East Germany	100	110	120	140
Hungary	30	37	45	72
Poland	118	146	182	250
U.S.S.R	1,150	1,450	1,750	3,750

[1] 1 ton of standard coal equivalent (SCE) =7,000,000 kilocalories.

collaborate with COMECON. COMECON is negotiating a proposal for the establishment of formal relations with the European Economic Community (EEC) as well as between the EEC and individual COMECON countries.

On July 9, 1975, the Supreme Soviet approved a new resource conservation law "Fundamental Principles of the Legislation of the U.S.S.R. and the Union Republics on Mineral Wealth." The legislation, which came into force on January 1, 1976, reflects the basic principles of the exclusive ownership of mineral resources by the State and specifies the task of enterprises, organizations, institutions, and citizens in this field. Those placed in charge of mineral resources are required to ensure a rational utilization of mineral resources with minimum losses and to prospect for minerals. Much attention is given in the legislation to the comprehensive use of mineral resources and to reclaiming land where mining has taken place. The basic principles of the legislation proceed from the need to enhance the role of planning and controlling State bodies in ensuring a rational use of mineral resources.[25]

Because of limited availabilities of good-quality mining machinery, the U.S.S.R., in an attempt to speed up development of mineral resources, is showing increasing interest in "joint" development ventures and in the exchange of scientific and technical services with foreign countries and Western firms. While the law prohibits any direct foreign capital investment in the U.S.S.R., the Soviet Union is anxious to attract West European, U.S., and Japanese firms to participate in "joint" production and marketing. 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 commodities produced by these operations. The joint ventures should give the Soviets help with one of their biggest problems: The efficient introduction and application of new technology.

West German firms are designing the 2,500-million-Deutsche mark (DM) ($1,080 million) Staryy Oskol steel works in Belgorod Oblast'. Reportedly, Salzgitter AG is responsible for the 4-million-ton ore-pelletizing plant. Fried. Krupp GmbH is working on the electric steel mill, and Korf Stahl AG is designing a direct-reduction unit for 2.5 million tons of sponge iron. Recently, an agreement was signed between Japan's Sakhalin Petroleum Development Cooperation Co. (SPDC) and the Soviet Union under which SPDC will provide financing of $152.5 million for the joint development of oil and natural gas resources on the Continental Shelf off Sakhalin Island.

According to an October 1973 agreement, Finnish companies are building the joint Kostamus iron ore complex in Soviet Karelia about 30 kilometers from the Finnish border. This project is to be built in three stages and is to have an annual capacity of about 8.3 million tons of pellets (24 million tons of crude ore). Preliminary estimates show that the total project will cost about $600 million. Also, the Allis Chalmers Co. has received a $35 million contract for a two-line iron ore pelletizing plant to be built near Kremenchug in the Ukraine.

The U.S.S.R. and Japan have reached an agreement on joint development of a coal deposit in Yakut A.S.S.R. In repayment for machinery and equipment, Japan will receive South Yakutsk coal for 20 years. By 1986, annual exports will exceed 5 million tons. The Soviet firm Machinoimport signed an agreement with Japan Sumitomo Shoji Kaisha, Ltd., for ten 26-cubic-yard superfront Marion power shovels for the Yakutsk coal project. The excavators will be manufactured in Japan. The Austrian Oil Administration, German Ruhrgas, and Gaz de France recently concluded a basic contract concerning the construction of a natural gas pipeline through Austria which is to supply France and Upper Austria with natural gas from the Soviet Union and Iran.

The Soviet Union has been negotiating with West European, U.S., and Japanese companies to develop the Udokan copper deposit in East Siberia. Discussion on participation of U.S. and Japanese firms in a $400 million preliminary exploration of natural gas in Yakut A.S.S.R. continued in 1975.

The top three Western suppliers of machinery and equipment to the U.S.S.R. are West Germany, Japan, and France, but some of this trade involves U.S. companies with branches in West Germany,

[25] Pravda, Moscow. July 10, 1975, p. 1.

France, Japan, and other countries. Reportedly, Pullman Inc. and its subsidiary M.W. Kellog are building 13 ammonia plants through licensees in Japan and France. Computer companies are selling through subsidiaries in France and West Germany. A General Motors licensee in Japan has sold logging equipment, and General Electric has provided pumps and compressors through wholly owned plants in France.

In 1975, the Soviet Union ordered 50 pumps, valued (together with spare parts) at about DM10 million ($4.3 million) from KHD Industrieanlagen AG Humbold Wedag. Seventy such pumps are already used in the mines of Yakut A.S.S.R. Norway's Akker group is negotiating with the Soviet firm Sudoimport for the sale of two semisubmersible (Akker H–3 600-foot capability) drilling platforms for offshore drilling in the Caspian Sea.

The Soviet Union continued to sponsor an active exchange program. According to J. M. Gvishiani, deputy chairman of the U.S.S.R. State Committee for Science and Technology, the Soviet Union has signed 170 scientific and technological agreements with industrial corporations in the West. Some 38 of the agreements were made with U.S. companies.

A Long-Term Program for the Development of Economic and Industrial Cooperation between the U.S.S.R. and the United Kingdom was signed in February 1975. The Soviet Union is interested in coal, iron and steel, and equipment for roadbuilding and for the oil refining and petrochemical industries. The program also included the possible development of the Udokan copper deposit. A 10-year Soviet agreement on economic, industrial, and technological cooperation was signed with the Netherlands in July and with Denmark in August 1975.

An agreement on scientific and technological cooperation was signed in October 1975 by the U.S.S.R. State Committee for Science and Technology with the Sandvik Co. of Sweden. The cooperation will include the production of machine tools and the manufacture of special steels. Reportedly, Phillips Petroleum (United States) has signed technical cooperation agreements with Soviet officials for exploration and production of petroleum.

Exhibitions in the U.S.S.R. play a key role in Soviet planning and purchasing of machinery and equipment. Western companies have the opportunity to meet Soviet planners, engineers and administrators to provide information about their equipment. For example, Metallurgimport has ordered a ripping machine for coal mine roadways valued at over $200,000 from Gullick Dobson International Ltd., United Kingdom. This machine was exhibited in Donetsk in August to September 1975. Prior to this order, Gullick Dobson had already sold nearly 150 low-incline-seam roof supports, which are operating in the Donets coal basin. The first Aluminum Exhibition was held in Moscow in July 1975. The Soviets showed great interest in Western machinery and production technology.

The Soviet Union encourages State-managed mineral resource development in the developing countries. The U.S.S.R. sends technicians and makes loans to countries willing to promote State development and distribution of fuels and minerals. Soviet technical assistance and economic aid programs include 420 projects [23] in about 70 countries at a cost of about 5 billion rubles. The Comecon International Investment Bank has established a special fund of 1 billion rubles to grant credits for economic and technical assistance to the developing countries. The fund began functioning in January 1974. This work is conducted through bilateral agreements as well as appropriate agencies of the United Nations. In many instances, the assistance to developing countries is linked with mineral supply to the U.S.S.R.

Iran and the U.S.S.R. have signed a cooperation agreement valued at about $3 billion. The Soviet-built steel plant at Isfahan, which currently produces around 600,000 tons per year of crude steel, is to be gradually expanded to approximately 8 million tons per year at a cost of $1,800 million. In May 1975, a Turkish delegation signed an agreement providing for Soviet technical aid in expanding the capacity of the Iskenderun iron and steel works from 1 million tons to 2 million tons annually. Soviet assistance to Portugal included developing the aluminum and ce-

[23] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 8, February 1976, p. 1.

ment industries through exploitation of nepheline deposits, the renovation of a coal mine, and possible assistance in construction of the nation's first nuclear powerplant. About 100 Soviet specialists were engaged in exploration in Sri Lanka for petroleum and natural gas in 1975. Sri Lanka shipped 1,200 tons of ilmenite concentrate to the U.S.S.R. for test purposes.

A 10-year agreement on economic and technical cooperation was signed by the U.S.S.R. and Cyprus in October 1975. Copper concentrates will be shipped by Cyprus to the U.S.S.R. A Soviet-Argentine cooperation agreement includes the construction of metallurgical and chemical plants and shipbuilding and port equipment. Mexico and the Soviet Union concluded an intergovernmental agreement on scientific and technical cooperation in 1975.

The 1976 plan, which was approved by the Supreme Soviet on December 3, 1975, calls for an overall increase in industrial output of 4.3%, including a 4.9% increase in consumer goods output. According to the chairman of the State Planning Committee, the low industrial growth rate of 4.3% set for 1976 is due to a shortage of agricultural raw materials from the 1975 harvest.

Capital investment in 1976 was to total 116,800 million rubles, a 4% increase over that of 1975. Major investment areas will be the fuel-energy sector (7% over the 1975 level), ferrous and nonferrous metallurgy (a 10% increase), the chemical industry (a 25% increase), and the machine building industry (a 12% increase). It was planned to increase the average monthly earnings of Soviet workers and employees in 1976 to 150 rubles, or 2.7% over those of 1975. The monthly minimum working wage was to increase to 70 rubles in a number of areas.

Special attention in the 1976 plan (as in the 1975 plan) is to be focused on the fuel and power sectors. The generation of electric power is to be increased by 75 billion kilowatt-hours to 1,095 billion kilowatt-hours. Crude oil extraction (including condensate) is planned at 420 million tons, 29 million tons over that of 1975. The total increase in petroleum production in 1976 is to come from West Siberia, where extraction of 180 million tons of crude oil was planned. Natural gas output is to amount to 313 billion cubic meters, an increase of 24 billion cubic meters over that of 1975. The main sources of increase in gas production in 1976 are to be West Siberia and Orenburg Oblast'.

Raw coal and lignite output is to be 715 million tons, 14 million tons over the 1975 level; the main annual increase in production of coal is to be of surface-mined lower rank coals from Siberia and Kazakhstan.

Raw steel output is to be increased by 6 million tons to 147 million tons. Finished rolled metal production is to be increased by 4.4 million tons. Captal investment in ferrous metallurgy is to be increased 10% over that of 1975. The 1976 nonferrous metallurgy plan calls for increased production of aluminum, copper, lead, and nickel. The output of platinum-group metals, gold, titanium, magnesium, and rare and other nonferrous metals are also to be increased. The planned increase of nonferrous metals in Kazakhstan follows: Alumina, 1.7%; refined copper, 6%; titanium, 5%; and rolled nonferrous metals, 4.3%. The output of aluminum at the Regar plant in Tadzhik S.S.R. is to be increased 56%, and that of copper in Georgian S.S.R., 130% over the 1975 output levels. The 1976 plan envisages the production of 94.5 million tons (Soviet standard) of mineral fertilizers, an increase of 4.5 million tons.

Annual production capacities in 1976 were to be increased as follows, in million tons: Raw coal and lignite, over 10; primary refining of crude oil, about 6; iron ore, 1; pig iron, 0.9; and mineral fertilizers, 0.24. New facilities for production of pig iron are to be put into operation at the Kommunarsk works and of steel pipe at the Seversk plant. Facilities for primary refining of crude oil were to be commissioned at the Pavlodar (Kazakhstan) and Novo-Bakinsk (Azerbaydzhan) refineries. The increase in iron ore capacity is to be obtained by constructing new facilities at the Krivoy Rog Basin, Kachkanar, and the Dneprovsk mining and processing complexes.

The declining reserves of raw material and fuels in the European part of the U.S.S.R. have forced Soviet planners to give increased attention to the north and east of the country. Developing these re-

Table 2.—U.S.S.R.: Industrial production in 1975 and planned 1976

(Million metric tons unless otherwise specified)

Commodity	1975 Originally planned	1975 Newly planned	1975 Actual	1976 Planned
Iron ore (usable)	254	235.5	233.0	NA
Pig iron	105–110	104.8	103.0	NA
Steel, raw	142–150	142.0	141.0	147
Mineral fertilizers (Soviet standard)	90.0	90.0	90.0	94.5
Coal, raw (bituminous, anthracite, and lignite)	685–695	700.0	701.0	715
Natural gas ... billion cubic meters	300–320	285.0	289.0	313
Petroleum, crude (including condensate)	480–500	489.4	491.0	520
Power, electric ... billion kilowatt-hours	1,030–1,070	1,035	1,038	1,095

NA Not available.

serves will be difficult owing to extreme climatic conditions and will also necessitate large capital investment in railroad and pipeline for long-distance transportation.

The Soviets plan to boost foreign trade 13.6% in 1976. Trade with Western countries, which will be primarily based on barter transactions, is to continue mainly with West Germany, Italy, Finland, France, the United States, and Japan.

The tenth 5-year plan (1976–80) foresees an increase in gross industrial production of 36%, down both from the 47% scheduled for the 5-year period ending 1975 and from the 43% actually achieved. The plan calls for lower growth rates in every key economic sector, except foreign trade which is planned to increase 33.5% during the next economic period (about the same goal as for the past 5-year period). Actually, the U.S.S.R. increased its trade during the last 5 years more than 50%, and the major increase was with Western countries.

Efficient use of capital investment and improved labor productivity both have high priorities under the tenth 5-year plan. The basic tasks of the new 5-year plan are the more intensive use of equipment, raw material, and supplies; improvement of product quality, reliability, and service life; increased productivity of machines; and increased profitability. The plan foresees reduction in consumption of rolled ferrous metals of 14% to 16% by machine-building and metal-processing industries and 5% to 7% in construction, as well as not less than a 5% to 6% decrease in cement consumption.

Accelerated development is planned for energy and mineral fuel commodities. During 1971–75 the share of petroleum and natural gas in total Soviet fuel and energy production amounted to 75% or more; in the future, however, the share is to decline. The share of coal will increase, especially during the next 5 years, because nuclear power will still not be supplying a major share of energy.

The country's potential wealth in water resources has been estimated at approximately 1,100 billion kilowatt-hours (of which about 160 billion kilowatt-hours has been developed); water resources are to continue to be among the less important energy sources (less than 20%) in the fuel-energy balance.

The following data show the principal goals for individual mineral commodities in the new 5-year plan:

1. The generation of 1,380 billion kilowatt-hours of electricity in 1980 is planned and the commissioning of an additional 71 million kilowatts of capacity (including 13 million to 15 million kilowatts at nuclear plants) is planned during the 1976–80 period. Construction of nuclear plants continues to be in the European part of the U.S.S.R. It is planned to construct large hydropower plants on the Yenisey and Angara Rivers in Siberia and to build a number of hydropower plants in European U.S.S.R., in particular in the northern Caucasus and Transcaucasus.

The plan provides for greater use of coal and lignite in thermal powerplants to make oil and natural gas available for export. The major plants scheduled for construction are near the Ekibastuz (Kazakhstan) and Kansk-Achinsk (Siberia) coal basins.

2. In 1971–75, crude oil and condensate output increased 39% (compared with

a 42% projected increase) to 491 million tons. The new plan estimates a 30% increase to 640 million tons by 1980. Pipeline networks are to be expanded—mainly to bring oil from Siberia to the European part of the U.S.S.R. It is planned to raise the 1975 volume of primary oil processing 25% to 30% by 1980.

3. Natural gas production is to be increased 50% to 435 billion cubic meters in 1980. This figure is more realistic than the one for the 1971–75 plan, which called for 62% growth and reached only 42%. A 36,500-kilometer addition to trunk and branch gas pipelines is also planned. There is to be a special effort to increase construction of underground gas storage units near large cities.

4. Raw coal (bituminous, anthracite, and lignite) production in 1980 is to be increased 14.8% over the 1975 level. This would bring production from 701 million tons in 1975 to 805 million tons in 1980.

The main base for coking and high-energy coals in the European part of the country continues to be the Donetsk Basin. Coal production there should rise to 226 million to 229 million tons in 1985. The Kuznetsk Basin in Siberia and the Karaganda Basin in Kazakhstan will be further developed, and production there in 1980 should reach 288 million tons. The Ekibastuz coalfield in Kazakhstan will become a major energy base; construction is being completed there of the country's largest open pit, Bogatyr'. Total production of the Ekibastuz coalfield in 1980 is to rise to 72 million tons. Accelerated development of the Nerungra coalfield in the southern region of Yakutia and the Kansk-Achinsk Basin in Siberia are both major elements in the new 5-year plan. During this period, production of coal by hydraulic methods is to be doubled.

5. Raw steel production is to reach 168.5 million tons in 1980, with finished rolled steel products at 117.5 million tons. In the iron and steel industry, special attention is to be devoted to improving quality and expanding the range of products. Technical changes will include the increasing use of surface mining of iron ores, erection of a large (5,000-cubic-meter) blast furnace, and increasing the use of oxygen and natural gas in pig iron production. The plan calls for improvement in iron ore preparation and more extensive use of pelletization and continuous casting. Also, additional and large (up to 400-ton capacity) oxygen converters are to be installed, and output of oxygen-converter steel is to be increased. It is planned to commission the direct iron ore reduction plant, which is to be constructed by West German companies in Kursk Oblast'.

6. In nonferrous metals, the plan calls for a significant increase in production by completing projects now underway, increasing capacities at existing facilities, and developing new installations. Production of aluminum, copper, and nickel is to be raised 20% to 30%; titanium production is to increase 40%. There will be increases in the production of lead, magnesium, tin, tungsten, molybdenum, and precious metals.

Priority is to be given to raising the output of natural diamond and nonferrous alloy metals, particularly lead, zinc, copper, tungsten, molybdenum, and gold. A main task is to increase metal recovery, especally from complex raw materials. The amount of open pit mining is to be increased. There will be a major expansion of the Norilsk copper-nickel and platinum-group metals complex. New investment in the nonferrous industry is estimated at 9 billion rubles, 50% more than was planned in 1971–75.

Kazakhstan will continue to be one of the largest producers of nonferrous metals. Capital investment in the nonferrous mining industry there is set at 1,900 million rubles, almost 50% more than in 1971–75. Three-quarters of the funds will be used for the development of mines and the construction of beneficiation plants for the production of copper, lead, zinc, and aluminum. It is planned to complete construction of the Orlovsk, Karagalinsk, mining and concentration plants and the No. 65 mine of the Dzhezkazgan complex by 1980. Development of the Annensk, Tishinsk, and Zharemsk mines will continue after 1980. In 1976–80, construction of the first stages of the Akzhalsk, Chatyrkulsk, and Boshchekulsk mining and concentration units and the Krasnooktyabrsk and Belinsk bauxite mines in Kazakhstan is to begin. In 1980, output of refined copper in Kazakhstan is to be increased 25%, lead 13%, zinc 9%, alumina 10%, and titanium 28% over the 1975 levels.[27]

7. Output of mineral fertilizers is programed to grow to 143 million tons per year (Soviet standard) by 1980 (including 5 million tons per year of chemical feed additives), an increase of 53 million tons over 1975 production. The growth is to be achieved by commissioning over 150 new production installations.

8. Geological prospecting activities are given special attention in the new 5-year plan, largely for exploration for oil, natural gas, and condensate fields in the Central Ob Valley and in Tyumen Oblast', in East Siberia, Yakut A.S.S.R., and Komi A.S.S.R., in Archangel Oblast', and in Central Asia and Kazakh S.S.R. in the region of the Caspian depression. Special efforts will also be put into offshore exploration for oil and natural gas.

Prospecting for deposits of coking and energy coals and lignites (particularly in the European part of the U.S.S.R.), for easily concentrated ores for ferrous and nonferrous industries, for precious metals and diamonds, and for raw material for the nuclear energy industry and for the production of mineral fertilizers will continue in 1976–80.

9. In order to carry out this plan, large resources will be required. Capital investment in the U.S.S.R. for the next 5 years has been set at a level of 621,400 million rubles, compared with 480,000 million to 490,000 million rubles under the 1971–75 plan, 352,000 million for 1966–70 plan, and 210,000 million rubles for the 1961–65 plan. One of the most important developments under the new plan is the geographical shift in new energy projects. In the development in the regions east of the coming 5 years, there is to be accelerated Urals, particularly in Siberia and Yakut A.S.S.R., where new fuel and power centers are to be developed.

The level of Soviet industrial production in 1975 and as planned for 1980 is given in table 3.[28]

Table 3.—U.S.S.R. Industrial production in 1975 and planned 1980

(Million metric tons unless otherwise specified)

Commodity	Production		Increase	
	1975 reported	1980 planned	Quantity	Percent
Coal, raw (bituminous, anthracite, and lignite)	701	805	104	14.8
Petroleum, crude, including condensate	491	640	149	30.4
Natural gas ..... billion cubic meters	289	435	146	50.5
Steel, raw	141	168.5	27.5	19.5
Rolled finished ferrous metal	98.6	117.5	18.9	19.2
Mineral fertilizers (Soviet standard)	90	143	53	58.9
Cement	122	143–146	21–24	17–20
Power, electric ..... billion kilowatt-hours	1,038	1,380	342	33.0

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 fulfillment of these plans. Since Soviet mineral statistics were not published in most cases, many of the data in the production table were estimated, and represent at best an order of magnitude. The Soviet Union reported an increase in industrial activity of 7.5% in 1975. This achievement exceeded the revised goal of 6.7% but remained below the 8.8% set in 1971 at the beginning of the 5-year plan. The increase in Soviet mineral production in 1975 was largely due to additional inputs of capacity and labor rather than to productivity gains.

Reportedly, 70 elements were produced in the U.S.S.R. in 1975. The Asian part of the U.S.S.R. (east of the Urals) provided about 45% of the total Soviet coal and lignite output, more than 30% of the natural gas, about 25% of crude oil, and around 30% of the electric power.

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[27] Kazakhstanskaya pravda, Alma-Ata. Feb. 7, 1976, p. 2.
[28] Pravda, Moscow. Mar. 2, 1976, p. 4.

The Russian Socialist Federated Soviet Republic (R.S.F.S.R.) continued to rank first among the 15 Soviet Republics in mineral production. It produced over 80% of the gold and silver, practically all of the platinum-group metals, more than 80% of the petroleum, about two-thirds of electric power, over 50% of pig iron, steel, and rolled ferrous products, and roughly 50% of the coal and natural gas. The Ukraine continued to rank first in the output of coking coal, manganese, and iron ores, and second in natural gas. During 1971–75, Ukrainian production of secondary aluminum increased 86.3%; secondary lead, 35.7%; alumina, 15.2%; and rolled nonferrous metals, 26.7%.

The Asian Republic of Kazakhstan, one of the most important base metal producing areas in the U.S.S.R., occupied third place in Soviet mineral production and was the nation's leading producer of chromite, copper, lead, zinc, and rare metals. The Urals produced over 26% of total Soviet pig iron, more than 30% of steel, and about 29% of ferrous rolled metal. The Ural-Volga region produced nearly one-half of the nation's total crude oil output. Most of the U.S.S.R.'s increased petroleum production was, however, derived from the West Siberian Fields.

The irregular geographical distribution of iron ores and ineffective planning of the development of the deposits led to long and expensive railroad shipments. For example, the ore from the Kola Peninsula, the Kursk region, and Krivoy Rog Basin is delivered to metallurgical plants in the Urals, a distance of 1,950 to 2,500 kilometers; the annual cost of railroad transportation amounted to hundreds of millions of rubles.[29] The Magnitogorsk, Novokuznetsk, and Nizhniy Tagil plants, where half of the Soviet pig iron is produced, have been relying on distant sources of ore for 50% of their requirements.[30] For 45 years, iron ore from the Magnitogorsk deposit in the Urals has been used by the Magnitogorsk complex and also has been shipped to Siberian metallurgical plants, a distance of about 2,000 kilometers. This deposit has been practically depleted, and now iron ore from the Magnitogorsk metallurgical complex, the largest in the U.S.S.R., is being transported more than 2,000 kilometers.

The Soviet nonferrous industry continued to be plagued by low worker productivity, although the total production of all nonferrous metals gained slightly in 1975. According to reports, there was an insufficiency of proved reserves of copper ores in the Urals, nickel on the Kola Peninsula, mercury in the Ukraine, and lead in Central Asia.[31] Because of the acute shortage of bauxite, the development of the aluminum industry was being delayed. To cover this shortage, nephelines and alunites were used. The following decrease of the index of metal content of mined ores is the main reason for low growth of nonferrous metals output:

Ore	Index of metal content in mined ores, 1970=100		
	1970	1974	1975 (planned)
Copper [1]	100	112.5	114.6
Lead	100	86.2	90.8
Zinc	100	87.6	89.6
Gold	100	94.8	82.7
Silver	100	81.9	77.0

[1] Increased production of high-copper content ores at the Rider mines in Kazakhstan.

Source: Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 7, July 1975, p. 9.

Beneficiation and metallurgical facilities of the nonferrous industry continued to experience poor metal recoveries; the industry recovered only about 60% of the total metal content of the ores. Some 80% to 90% of rare metals was lost during the beneficiation processes.[32] Between 15 and 20 tons of bismuth is lost at the Alaverdy complex in Armenia annually.[33] During the smelting of copper-zinc concentrates in the Urals, about 70,000 tons of zinc is lost annually.[34]

[29] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Dec. 18, 1975, p. 2.

[30] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 5, 1976, p. 9.

[31] Voprosy ekonomiki (Problems of Economics), Moscow. No. 1, January 1974, pp. 27–36.

Work cited in footnote 30.

[32] Bezopasnost' truda v promyshlennosti (Labor Safety in Industry), Moscow. No. 8, August 1975, p. 60.

Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 7, July 1975, p. 315; No. 9, September 1975, pp. 15–19.

Razvedka i okhrana nedr (Exploration and Conservation of Mineral Resources), Moscow. No. 10, October 1975, p. 32.

[33] Promyshlennost' Armenii (Armenian Industry), Yerevan. No. 4, April 1975, p. 58.

[34] Tsvetnye metally (Nonferrous Metals), Moscow. No. 8, August 1975, p. 11.

There are also important slag losses. Because of the lack of facilities, 2 million tons of pyrite slags, containing 18,000 tons of copper, 30,000 tons of zinc, 800 to 900 tons of cobalt, 50 tons of silver, and other useful minerals, are not processed annually.[35] The dumped slags of the Alaverdy plant in Armenia contain up to 1% copper.[36] All platinum-group metals, 50% of the silver, 30% of the sulfur, and 10% of the zinc, lead, and copper were produced in the U.S.S.R. as byproducts.[37]

The general level of technology in the Soviet mineral industry has lagged consistently behind that of the more advanced Western countries. 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 workers), for roof support in development workings (24,000 workers), for loading of coal and rock in development of workings (20,000 workers), and for maintenance of workings (76,000 workers).[38] Many operations in loading and maintenance shops of nonferrous enterprises were performed manually.[39]

The Soviets are increasingly conscious of the age and obsolescence of their machine tools and of much of their mining and metallurgical machinery and equipment. The Soviet machine industry continues to turn out inefficient models because the emphasis is on production and no time is allowed 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 as obsolete equipment 43 blast furnaces, 80 open-hearth furnaces, 97 rolling mills, about one-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 ferrous rolled metal.[40] Out of 200 coking batteries in the U.S.S.R., more than 100 have been operating for more than 20 years, some of them for 40 years. Many have become obsolete or are being used beyond their economic life.[41]

The use of obsolete drilling rigs and an inferior quality of drilling bits and drilling steel in underground metal mining increased the required number of manual workers.[42] The petroleum and gas industries have their own special problems. The drilling of exploratory and developmental wells in these industries failed to meet planned targets.[43] Automation of Soviet rolling mills lags behind that of the Western countries.[44]

Soviet investigations show that coal production equipment is utilized at an average rate of 40% to 45%; the plan calls for 65% utilization, or a downtime of 35%. As a result, the coal industry is losing production valued at more than 180 million rubles per year.[45] In the cement industry, for each rotary furnace, there is an average of 50 periods of idle time each year, resulting in industrywide losses of 18,000 to 20,000 hours per year.[46]

Extensive prospecting and exploration for practically all commodities is 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 1975, including a staff of about 65,000 graduate specialists with a university education and over 53,000 graduate technicians. Some 4 billion rubles was allocated for geological exploration in 1975.

Appropriations for prospecting for petroleum and natural gas increased from

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[35] Material'no-tekhnicheskoye snabzheniye (Material-Technical Supply), Moscow. No. 8, August 1975, p. 59.
[36] Promyshlennost' Armenii (Armenian Industry), Yerevan. No. 6, June 1975, p. 39.
[37] Vestnik Leningradskogo Universiteta (Herald of Leningrad University), Leningrad. No. 6, June 1975, p. 8.
[38] Ugol' (Coal), Moscow. No. 8. August 1972.
[39] Finansy U.S.S.R., Moscow. No. 8, August 1974, pp. 29–34.
[40] Ekonomika i organizatsya promyshlennogo proizvodstva (Economics and Organization of Industrial Production), Novosibirsk. No. 4, April 1974, pp. 70–84.
[41] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Oct. 19, 1974, p. 2.
[42] Work cited in footnote 41.
[43] Pravda Ukrainy, Kiev. Sept. 12, 1974, p. 1.
[44] Ekonomika Sovetskoy Ukrainy (Economics of the Soviet Ukraine), Kiev. No. 7, July 1974, pp. 53–58.
[45] Sotsialisticheskaya industriya (Socialist Industry), Moscow. June 30, 1974, p. 2.
[46] Tsement (Cement), Moscow. No. 8, August 1974, p. 9.

689 million rubles in 1969 to 2,000 million rubles in 1975.[47] Over 2,500 geological and geophysical teams were permanently employed in the prospecting and exploration of petroleum and gas fields. Only 5% to 10.5% of the completed wells were in the Volga area and in Belorussian S.S.R.[48]

Although exploration for reserves of minerals and fuels, particularly petroleum and gas, has grown considerably, most of the reserves are located in relatively undeveloped areas. Even though many of the known ore bodies include deposits of manganese, chromite, diamond, asbestos, and lead metal content similar to ores mined in the rest of the world, some of the proved deposits are poor and the ore difficult to concentrate.

Until very recently, most of the nickel ores mined in the U.S.S.R. were low in mineral content. The situation is similar with regard to mercury, tin, and aluminum raw materials. Approximately 20% of the iron ore reserves require complicated methods of concentration. Recently, there has been some decline in the average metal content of lead, zinc, copper, molybdenum, tungsten, and other ores.

In many instances, exploratory surveys and geophysical work have not substantially improved the U.S.S.R.'s reserves position. This is particularly true of nonferrous metals, rare metals, and gold. The production facilities at 34 enterprises of the nonferrous minerals processing industry, which were built recently, continued to experience ore shortages and losses due to miscalculations in estimating ore reserves.[49]

As a result of the Soviet machine-building industry's deliveries of lower quality equipment, especially for drilling, drilling efforts were impeded, and drilling costs rose along with rising petroleum production costs.[50]

The U.S.S.R. continued to experience difficulties in completing mineral industry projects on schedule because of shortages of material, equipment, and labor, and organizational problems. Construction of new projects remained inadmissibly slow, expensive, and frequently widely dispersed with the work taking two to three times as long as specified by the U.S.S.R. State Construction Committee. This contributed to a disparity between mine, concentrator, and metallurgical plant capacity. The practice of putting mines and plants into operation with many expedients has resulted in great inefficiencies and prolonged delays before design capacity is achieved. For example, on January 1, 1975, planned capacity goals had not been reached at 12 lead-zinc, 4 copper, 7 aluminum, and 6 nonferrous rolled metals enterprises. At the Achinsk alumina plant design capacity achieved only 53.6%.[51] The Rovny nitrogen and Uvarovo chemical plants utilized only 40% to 60% of their capacities.[52] Construction plans of many installations were met according to ruble expenditures, but facilities were not put into operation.[53]

New enterprises that became operational in the iron and steel industry included the No. 4 blast furnace at the Karaganda complex, the No. 2 oxygen-converter shop with an annual capacity of 4 million tons at the Novolipetsk plant, the "2000" mill at the Cherepovets plant, and new facilities at the Lebedinsk, Novokrivorozhsk, Kachkanar, Sokolovsk-Sarbaysk, and Dneprovsk iron ore mining and processing combines.

In the field of nonferrous industry, the following facilities were put into operation in 1975: The first potline at the Regar aluminum plant in Tadzhik S.S.R., the second stage of the Madneulsk mining and processing combine in Georgian S.S.R., and the first stage of the No. 65 mine and the second stage of the No. 10 section of the dressing plant at the Dzhezkazgan complex in Kazakhstan. New facilities also were put onstream at the Kargalinsk, Irtysh, and Achisay polymetallic, Zyryanovsk lead, and Ust'-Kamenogrosk titanium-magnesium complexes in Kazakh S.S.R.

Large new capacities for the production of mineral fertilizers were started up

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[47] Geologiya nefti i gaza (Geology of Petroleum and Natural Gas), Moscow. No. 12, December 1975, pp. 1–9.
Razvedka i okhrana nedr (Exploration and Conservation of Mineral Resources), Moscow. No. 7, July 1975, p. 1.

[48] Pages 9–19 of first work cited in footnote 47.

[49] Razvedka i okhrana nedr (Exploration and Conservation of Mineral Resources), Moscow. No. 1, January 1975, pp. 1–28.

[50] Trud (Labor), Moscow. Oct. 24, 1975.

[51] Tsvetnye metally (Nonferrous Metals), Moscow. No. 1, January 1975, pp. 1–4.

[52] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Dec. 13, 1975, p. 1.

[53] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Nov. 16, 1975, p. 1.

at the Rovny and Novomoskovsk chemical works and Ionava nitrogen fertilizer plants. New installations at the Dzhambul double-superphosphate plant and at the Karatau phosphorite complex were also commissioned in 1975.

In the coal and lignite industry, three underground mines were reported to have come onstream in 1975: Voroshilovskaya No. 1, in Komi A.S.S.R.; Pervomayskaya, in Kemerovo Oblast'; and Zapadno-Donbasskaya No. 25/26, in Dneprovsk Oblast'.

Construction of the Baykal Amur Railway (BAM) continued in 1975. There were about 60,000 people working on this railway. Once BAM is completed about 1982, the emphasis is to be transferred to the railway linking BAM with Yakutsk. Yakut A.S.S.R. is planned to become a major mineral producer during the 1980's.

Capital investment in the Soviet economy amounted to 114 billion rubles in 1975, 9% over that of 1974. In 1975, planned investment in the construction of new facilities and enlargement and renovation of existing facilities of the ferrous industry was 3 billion rubles, or 11.8% more than in 1974. About 2,500 million rubles was alloted for development of the Soviet coal and lignite industry. Capital investment in crude oil extraction was planned at 4 billion rubles, including about 1 billion rubles in West Siberia. The 1975 plan envisaged development of new installations for extracting 87 million tons of crude oil and drilling 8,520,000 meters (7,500,000 in 1974) of developmental wells.

Additional production capacities, including new or expanded plant and renovation of existing facilities, in million tons or as otherwise specified, follow:

Commodity	1972	1973	1974	1975	
				Planned	Actual
Iron ore, crude	28.5	39.0	24.4	45.0	27.3
Coal and lignite, raw	18.0	34.0	19.4	NA	24.7
Pig iron	--	3.7	4.0	1.0	1.8
Steel, raw	2.2	--	3.0	4.2	4.0
Finished ferrous rolled metal	1.6	3.5	1.6	6.0	3.3
Mineral fertilizers (Soviet standard)	7.0	8.9	7.0	13.7	11.7
Cement	4.2	3.7	5.6	NA	4.4
Powerplant million kilowatts	1.5	11.0	10.0	NA	13.0

NA Not available.

Table 4.—U.S.S.R.: Estimated [1] production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
METALS			
Aluminum:			
Ores and concentrates:			
Bauxite, 26% to 52% alumina	4,300	4,300	4,400
Nepheline concentrate, 25% to 30% alumina	[r] 1,200	1,300	1,300
Alunite ore, 16% to 18% alumina	[r] 400	400	400
Alumina	2,400	2,400	2,780
Metal, smelter:			
Primary	1,360	1,430	1,530
Secondary	125	140	150
Antimony, mine output, metal content ... metric tons	[r] 7,100	7,300	7,500
Arsenic, white (As_2O_3) ... do	7,250	7,300	7,350
Beryllium, beryl, cobbed, 10% to 12% BeO ... do	1,450	1,500	1,600
Bismuth, mine output, metal content ... do	55	60	60
Cadmium, smelter ... do	2,500	2,600	2,650
Chromium, chromite ore, 30% to 56% Cr_2O_3	1,900	1,950	2,080
Cobalt:			
Mine output, metal content ... metric tons	1,700	1,750	1,800
Smelter ... do	1,700	1,750	1,800
Copper:			
Ore:			
Gross weight, 0.5% to 2% Cu	70,000	74,000	76,500
Metal content, recoverable	700	740	765
Blister:			
Primary	700	740	765
Secondary	150	160	160
Refined:			
Primary	665	705	730
Secondary	150	160	160
Gold, mine output, metal content ... thousand troy ounces	7,100	7,300	7,500
Iron and steel:			
Iron ore, 55% to 63% Fe	[2] 216,104	[3] 224,883	[3] 232,803
Agglomerated products:			
Sinter [3]	146,123	148,796	151,943
Pellets [3]	21,545	23,417	27,209
Pig iron and ferroalloys: [3]			
Pig iron for steelmaking	86,225	90,167	93,803
Foundry pig iron	8,712	8,709	8,156
Spiegeleisen	83	107	104
Ferromanganese	888	859	878
Other blast furnace ferroalloys	[r] 25	26	27
Total	95.933	99,868	102,968
Crude steel: [3]			
Ingots	123,182	127,248	132,278
Steel for casting	8,299	8,958	9,047
Total	131,481	136,206	141,325
Semimanufactures: [3]			
Sections	35,937	36,814	37,680
Wire rod	7,990	8,073	8,283
Pipe stock	5,290	5,394	5,624
Tubes from ingots	1,657	1,652	1,656
Plates and sheets:			
Over 5 millimeters thick	11,592	12,295	12,933
Other	16,352	16,714	18,111
Total plates and sheets	27,944	29,009	31,044
Strip	8,919	9,337	10,072
Railroad track material	3,688	3,703	3,816
Wheels, tires, axles	946	1,059	1,124
Unspecified shapes for sale	682	779	912
Other and unspecified	65	65	73
Total semimanufactures	93,118	95,885	100,284
Selected end products: [3 4]			
Welded pipes and tubes	8,313	8,735	9,499
Seamless pipes and tubes	6,058	6,224	6,464
Total pipes and tubes	14,371	14,959	15,963
Cold-rolled sheet	5,813	6,492	6,809
Tinplate	561	613	613
Galvanized sheet	612	638	680
Electrical sheet	1,007	1,111	1,124
Cold-reduced strip	320	352	398
Wire, plain	3,473	3,724	3,818
Lead:			
Mine output, recoverable metal content	470	475	480

See footnotes at end of table.

Table 4.—U.S.S.R.: Estimated [1] production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS—Continued			
Lead—Continued			
Smelter:			
Primary	470	475	480
Secondary	90	95	95
Magnesium metal including secondary	57	60	63
Manganese ore, gross weight	[2] 8,245	[2] 8,500	8,800
Mercury metal including secondary ----76-pound flasks	52,000	54,000	55,000
Molybdenum, mine output, metal content ----metric tons	8,500	8,800	9,060
Nickel:			
Mine output, metal content	115	125	132
Smelter	135	145	152
Platinum, mine output, metal content--thousand troy ounces	2,450	2,500	2,650
Silver metal including secondary ----do	41,000	42,000	43,000
Tin:			
Mine output, recoverable metal content ----metric tons	29,000	29,500	30,000
Smelter:			
Primary ----do	29,000	29,500	30,000
Secondary ----do	10,000	10,000	10,000
Titanium metal ----do	27,000	28,000	30,000
Tungsten concentrates, contained tungsten ----do	7,400	7,600	7,800
Vanadium content of exported slag [5] ----do	r 3,852	3,294	e 3,200
Zinc:			
Mine output, recoverable metal content	670	680	690
Metal:			
Primary	670	680	690
Secondary	70	75	75
NONMETALS			
Asbestos	1,280	1,360	1,900
Barite	320	330	350
Boron minerals and compounds, B_2O_3 content	75	80	80
Cement, hydraulic [6]	r 109,248	115,140	121,920
Clays, kaolin (including china clay)	2,100	2,100	2,200
Corundum, natural ----metric tons	7,000	7,000	7,500
Diamond:			
Gem ----thousand carats	1,900	1,900	1,950
Industrial ----do	7,600	7,600	7,750
Total ----do	9,500	9,500	9,700
Diatomite	390	400	410
Feldspar	270	275	280
Fertilizer materials:			
Crude:			
Nitrogen compounds, N content	r 2 7,241	[2] 7,856	9,000
Phosphatic:			
Apatite:			
Ore, 17.7% P_2O_5	31,300	35,600	35,600
Concentrate, 39.4% P_2O_5	13,000	15,300	15,300
Sedimentary rock:			
Ore, 13% P_2O_5	21,500	22,000	25,400
Concentrate, 19% to 25% P_2O_5	10,750	11,000	12,700
Potassic, potash, K_2O equivalent	[2] 5,918	[2] 6,586	6,800
Manufactured:			
Nitrogenous	[2] 35,310	[2] 38,308	NA
Phosphatic:			
Meal, gross weight	[2] 5,395	[2] 5,442	NA
Other, gross weight	[2] 17,305	[2] 20,863	NA
Potassic, gross weight	[2] 14,224	[2] 15,832	NA
Other and unspecified, gross weight	r 2 98	--	NA
Total	[2] 72,332	80,445	NA
Fluorspar	440	450	475
Graphite	85	90	90
Gypsum	4,700	4,700	5,000
Lime, dead-burned	22,000	22,000	23,000
Magnesite:			
Crude	3,400	3,500	3,600
Marketable product	1,710	1,730	1,800
Mica	40	41	42
Pyrite:			
Gross weight	7,300	7,500	7,900
Sulfur content	3,500	3,600	3,700
Refractory materials:			
Dinas (quartzite-lime)	[2] 621	[2] 632	NA
Magnesite and chrome magnesite	r 2 1,663	[2] 1,718	NA

See footnotes at end of table.

Table 4.—U.S.S.R.: Estimated [1] production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
NONMETALS—Continued			
Refractory materials—Continued			
Magnesite powder	r 2 1,332	2 1,385	NA
Shamotte	r 2 6,327	2 6,425	NA
Total	r 2 8,711	2 8,896	NA
Salt, all types	2 12,900	2 13,400	14,000
Sulfur, elemental (excluding sulfur content of pyrite):			
From ores	2,300	2,400	2,500
Byproduct recovered	1,850	1,900	2,000
Talc	400	410	420
MINERAL FUELS AND RELATED MATERIALS			
Coal: 7			
Anthracite	2 76,433	2 75,828	76,000
Bituminous:			
Coking	2 173,445	2 175,535	180,000
Other (not specifically identified)	2 260,743	2 272,000	279,000
Total "hard" coal	2 510,621	2 523,363	535,000
Lignite and brown	2 156,960	2 160,641	166,000
Coke, oven, beehive, breeze, and gas coke	8 81,401	8 82,641	3 83,543
Fuel briquets:			
From anthracite and bituminous coal	8 1,474	e 1,500	e 1,550
From lignite and brown coal	8 6,673	e 6,808	e 6,900
Total	8,147	8 8,308	e 8,450
Gas, natural:			
Gross production ....million cubic feet	r 8,800,000	9,700,000	10,760,000
Marketed production ....do	r 2 8,345,735	2 9,201,299	10,205,890
Peat:			
Agricultural use	133,100	131,600	131,600
Fuel use	2 58,500	60,000	60,000
Oil shale	2 31,123	2 33,266	32,500
Petroleum:			
Crude:			
As reported, gravimetric units 2	429,037	458,948	491,000
Converted, volumetric units thousand 42-gallon barrels	r 3,153,422	3,373,268	3,608,850
Refinery products 9	r 10 328,300	10 352,496	378,000

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Estimate except where otherwise noted.
[2] Reported in Soviet sources.
[3] United Nations. Annual Bulletin of Steel Statistics for Europe, 1975. New York. V. 3, 1976, pp. 11, 23.
[4] 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.
[5] Partial figure, representing only that vanadium exported in slags; does not include vanadium produced for domestic consumption in any form or for export in any form except slag.
[6] United Nations. Monthly Bulletin of Statistics. V. 31, No. 1, 1977, p. 77.
[7] 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.
[8] United Nations. Annual Bulletin of Coal Statistics for Europe, 1974. New York. V. 9, 1975, pp. 31, 57.
[9] Not distributed by type, and therefore not suitable for conversion to volumetric units. Data include only energy products; asphalt, lubricants, petrochemical feedstocks, etc. are excluded.
[10] United Nations. World Energy Supplies 1950–74. Statistical Papers Ser. J, No. 19, 1976, p. 331.

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 traded with 112 countries, and in 89 cases the trade was based on interstate agreements. Soviet foreign trade continued to be oriented toward imports of needed production machinery and equipment, including complete industrial plants. Exports of minerals produced foreign exchange to help pay for imports, even though most of the minerals exported were in demand in internal markets. The sale of minerals, as of other Soviet products, is carried out largely under bilateral trade agreements negotiated on a state-to-state basis.

International trade ranks high in the mineral industry's priorities. Since the value and volume of trade is directed by the Ministry of Foreign Trade, planned exports and imports reflect national goals and priorities. There is, therefore, an implied commitment to exports to achieve a desired trade balance. The high priorities placed upon achieving such goals may result in commodity sales below world price levels.

The Soviet foreign trade turnover (exports plus imports) in 1975 reached 50.7 billion rubles, an increase of 11.1 billion rubles, or 28%, over that of 1974. Exports rose by 3.2 billion rubles to reach 24 billion rubles, while imports increased by 7.9 billion rubles to reach 26.7 billion rubles. Soviet trade with centrally planned economy countries amounted to 28 billion rubles (over 56% of total trade), of which 26.3 billion rubles (or about 52%) was with COMECON nations; 15.8 billion rubles (over 31%) of trade was with developed Western countries, and 6.3 billion rubles (about 13%) was with developing countries.

The volume of total official trade with leading Western developed countries in 1972, 1973, 1974, and 1975 follows, in million rubles:

Country	1972	1973	1974	1975
West Germany	827	1,210	2,209	2,800
Japan	816	994	1,683	1,900
Finland	602	777	1,540	1,700
Italy	468	614	1,137	1,400
France	544	722	941	1,200
United Kingdom	558	715	890	960
United States	538	1,161	742	1,600

Soviet figures for foreign trade in 1975 provide evidence of the declining importance of the centrally planned economy countries in the Soviet Union's external trade. Whereas trade with centrally planned economy countries represented 65.4% of the total in 1971, it was only 58.5% in 1973 and 56% in 1975. Trade with COMECON countries declined from 59.6% of the total in 1972 to about 52% in 1975.

The Soviet official trade turnover with COMECON nations in 1972, 1973, 1974 and 1975 follows, in million rubles:

Country	1972	1973	1974	1975
East Germany	3,705	3,965	4,315	5,623
Poland	2,803	3,000	3,584	4,853
Czechoslovakia	2,626	2,760	3,029	3,911
Bulgaria	2,345	2,555	2,904	3,991
Hungary	1,882	2,064	2,282	3,274
Romania	1,053	1,130	1,191	1,526
Cuba	822	1,110	1,642	2,589
Mongolia	287	338	404	480

Trade with the developing countries grew through the expansion of economic and technical assistance; the U.S.S.R. has concluded such trade agreements with more than 70 developing countries, Egypt being the largest trading partner, followed by India, Iran, Iraq, Brazil, and Argentina.

Official trade turnover with some leading nations of this group in 1973, 1974 and 1975 follows, in million rubles:

Country	1973	1974	1975
Egypt	541	728	710
India	589	615	685
Iran	275	496	510
Iraq	332	453	596
Brazil	126	202	396
Argentina	77	137	304

The Soviet Union, with a net debt of $10.7 billion, accounted for over 36% of overall COMECON net indebtness to the West. The breakdown of Soviet indebtedness at yearend 1975, in million dollars, follows:

Country	Value
France	3,300
West Germany	3,000
Italy	1,150
Japan	850
United Kingdom	700
United States	468
Austria	300
Sweden	125
Other	200
Total	10,093
Supplier credits	1,800
Private Western bank credits	5,992
Gross indebtedness	17,885
Undrawn official credits	5,010
Deposits with Western banks	2,208
Total	7,218
Net indebtedness	10,667

Source: Mariam Karr Eastwest Markets, Sept. 20, 1976.

Quantitatively, there was no significant change in patterns of Soviet mineral trade in 1975 from those of 1974. Fuels, metals, and mineral raw materials continued to play the largest role in Soviet exports and represented about 40% of total official exports during 1975. Along with gold, platinum-group metals, chrome ore, manganese ore, aluminum, zinc, lead, asbestos, apatite concentrate, potassium, cement, pig iron, ferroalloys, steel, coal, petroleum, and coke, the country now exports diamond, titanium, nickel, copper, rare metals, and natural gas.

The Soviet Union provides nearly 100% of the COMECON nations' imports of crude oil, natural gas, pig iron, and power; 66% of their petroleum products, rolled ferrous metals, and phosphorous fertilizers; 60% of coal and manganese ore; and up to 90% of iron ore. The export of Soviet petroleum to COMECON members increased from 138 million tons during 1966–70 to some 243 million tons between 1971 and 1975. In 1975, Soviet-Yugoslav trade reached a value of 1,558 million rubles. It is anticipated that trade turnover in 1976 may exceed a value of 2 billion rubles. The U.S.S.R. will supply Yugoslavia with petroleum, coal, metals and other raw materials in exchange for Yugoslav bauxite, nonferrous metals, and other goods. Soviet trade with Cuba increased from 1,045 million rubles in 1974 to 2,589 million rubles in 1975. Soviet exports to Cuba included ferrous and nonferrous metals, petroleum (over 7.6 million tons in 1974), anthracite, coke, sulfur, mineral fertilizers, etc. In addition to other goods, Cuba delivered nickel concentrates to the Soviet Union.

Soviet trade in selected mineral commodities in 1974 and 1975 by country group is presented in tables 5 and 6.

Mineral commodity imports in 1975 included ferrous and nonferrous semimanufactures, steel pipe, bauxite and alumina, tin, tungsten concentrate, talc, and mica. There was a considerable increase in imports of machinery and other industrial equipment, which came mainly from Western countries. The Soviet Union has also increased imports of large-diameter steel pipe, rolled steel, and nonmetallic minerals. Soviet import policy on petroleum consists of buying mainly from the Middle East and North Africa. Natural gas is imported from Iran and Afghanistan.

Trade tables 7 and 8 are derived from the official statistics of the Ministry of Foreign Trade for 1973 and 1974. Official detailed figures for 1975 are not yet available, but much the same general pattern can be expected.

Table 5.—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
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	181.2	.4	181.6	114.3	2.1	116.4	248.0
Lead	86.8	.6	87.4	8.1	--	8.1	95.5
Aluminum	367.3	22.7	390.0	127.8	4.9	132.7	522.7
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
1975:							
Coal	15,200	1,600	16,800	8,800	500	9,300	26,100
Crude oil and products	71,900	6,000	77,900	47,900	4,600	52,500	130,400
Iron ore	38,100	200	38,300	5,300	--	5,300	43,600
Manganese ore	1,160	50	1,210	201	--	201	1,411
Chromium ore	297	81	378	793	--	793	1,171
Pig iron	4,360.4	28.7	4,389.1	239.9	100.2	340.1	4,729.2
Rolled steel	5,634.9	391.3	6,026.2	20.8	380.4	401.2	6,427.4
Steel pipe	287.0	15.7	302.7	18.0	18.0	36.0	338.7
Copper	126.5	2.2	128.7	76.9	--	76.9	205.6
Lead	87.7	.6	88.3	10.6	--	10.6	98.9
Aluminum	363.5	18.2	381.7	119.1	1.6	120.7	502.4
Fertilizers:							
Phosphorus	529.5	.3	529.8	.1	--	.1	529.9
Potassium	4,011.9	210.5	4,222.4	1,748.6	15.1	1,763.7	5,986.1
Nitrogen	619.8	32.7	652.5	139.7	419.5	559.2	1,211.7

Source: Vneshnyaya torgovlya (Foreign Trade), Moscow. No. 6, June 1975, pp. 51–55; No. 9, September 1976, pp. 46–49.

Table 6.—U.S.S.R.: Imports 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 imports
1974:							
Coal	9.8	--	9.8	--	--	--	9.8
Crude oil and products	1.0	--	1.0	--	4.4	4.4	5.4
Pig iron	--	20.8	20.8	--	118.1	118.1	138.9
Rolled steel	761.0	252.9	1,013.9	4,000.6	34.7	4,035.3	5,049.2
Steel pipe	488.0	35.6	523.6	1,654.2	1.8	1,656.0	2,179.6
Copper	.4	--	.4	4.5	--	4.5	4.9
Lead	.3	49.4	49.7	27.5	--	27.5	77.2
Fertilizers:							
Phosphorus	--	20.0	20.0	223.2	--	223.2	243.2
Nitrogen	--	15.0	15.0	--	--	--	15.0
1975:							
Coal	9.8	--	9.8	--	--	--	9.8
Crude oil and products	.9	--	.9	.1	6.5	6.6	7.5
Pig iron	--	41.2	41.2	--	93.6	93.6	134.8
Rolled steel	519.7	170.8	690.5	3,165.9	41.3	3,207.2	3,897.7
Steel pipe	631.3	92.5	723.8	1,990.1	8.9	1,999.0	2,722.8
Copper	--	--	--	8.5	--	8.5	8.5
Lead	--	30.7	30.7	26.0	--	26.0	56.7
Fertilizers:							
Phosphorus	--	--	--	136.6	--	136.6	136.6
Nitrogen	--	15.4	15.4	--	--	--	15.4

Source: Vneshnyaya torgovlya (Foreign Trade), Moscow. No. 9, September 1976, pp. 46–49.

Table 7.—U.S.S.R.: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal:			
Unwrought	518,300	528,713	East Germany 109,893; Czechoslovakia 97,632; Hungary 96,526; Japan 41,681.
Semimanufactures, rolled only	r 116,318	101,510	Poland 14,937; Czechoslovakia 10,362; Bulgaria 10,340; Egypt 8,747.
Antimony, unwrought	1,054	NA	NA.
Cadmium, unwrought	1,088	925	Netherlands 480; East Germany 166.
Chromium, chromite ore and concentrate thousand tons	1,200	1,139	United States 317; Sweden 182; Poland 125; Czechoslovakia 107.
Copper:			
Copper sulfate	22,200	20,776	Bulgaria 8,182; Hungary 3,900.
Unwrought metal:			
Unalloyed	237,700	247,978	Czechoslovakia 38,705; Netherlands 38,107; Hungary 33,128; France 16,635.
Alloyed	8,700	3,747	West Germany 1,808; Netherlands 367.
Semimanufactures, rolled only:			
Unalloyed	8,400	8,885	Cuba 3,380; Czechoslovakia 1,301; Bulgaria 884.
Alloyed	9,100	9,625	Bulgaria 1,378; Cuba 1,075.
Iron and steel:			
Iron ore thousand tons	41,400	43,267	Czechoslovakia 11,820; Poland 11,389; Romania 5,699; Hungary 3,910.
Scrap do	r 1,800	1,465	Italy 273; Yugoslavia 273; East Germany 237.
Pig iron do	5,200	4,910	Poland 1,614; Czechoslovakia 896; East Germany 856; Romania 497.
Ferroalloys:			
Ferrochromium	46,400	46,430	NA.
Ferromanganese	135,000	118,298	NA.
Ferrosilicon	148,400	151,420	NA.
Ferrovanadium	1,200	1,623	NA.
Silicochrome [1]	2,688	2,966	NA.
Silicomanganese	11,204	10,688	NA.
Other (unspecified)	r 47,108	54,380	NA.
Total [2]	r 392,000	385,805	Czechoslovakia 102,401; Romania 93,299; Hungary 41,235; West Germany 37,201.
Steel ingots and other primary forms thousand tons	1,073	1,727	Bulgaria 644; Romania 283; Yugoslavia 155.
Steel semimanufactures:			
Angles, shapes, sections do	1,714	1,681	East Germany 446; Bulgaria 369; Hungary 164; Poland 144; Romania 80.
Wire rod do	565	535	East Germany 152; Romania 92; Poland 85; Hungary 80.
Plate do	1,846	1,827	East Germany 1,214; Bulgaria 149; Hungary 138; Czechoslovakia 120.
Sheet:			
Tin plate do	91	59	Cuba 27; East Germany 10; Bulgaria 6.
Other do	993	899	East Germany 468; Poland 135; Hungary 89; Yugoslavia 67; Bulgaria 57.
Strip do	10	8	Romania 3; Yugoslavia 3; Bulgaria 2.
Railway track material do	338	375	East Germany 171; Poland 99; Bulgaria 42; Romania 18.
Wheels, tires, axles [1] do	58	50	Poland 29; East Germany 20.
Pipes, tubes, fittings do	344	322	East Germany 187; Cuba 42; People's Republic of China 10; Poland 9.
Wire do	74	77	Cuba 24; East Germany 18; Bulgaria 7.
Undistributed by type do	4	30	NA.
Total do	6,037	5,863	

See footnotes at end of table.

Table 7.—U.S.S.R.: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Lead, unwrought	97,000	95,513	East Germany 45,408; Czechoslovakia 25,028; Hungary 11,101.
Magnesium, unwrought	23,300	27,884	Netherlands 6,620; West Germany 4,416; East Germany 3,964; Czechoslovakia 1,695.
Manganese:			
Ore and concentrate:			
Metallurgical grade thousand tons	1,300	1,482	Poland 495; Czechoslovakia 329; Japan 194; East Germany 150.
Battery and chemical grade do	9	[1] 1	All to Netherlands.
Metal [1]	22	6	All to Sweden.
Tin metal alloys, Babbitt metal	16	--	
Vanadium slag	r 42,880	36,602	NA.
Zinc, unwrought	146,400	114,811	East Germany 44,263; Czechoslovakia 22,844; India 14,243.
Other metals (unspecified):			
Unwrought	51,342	64,122	NA.
Semimanufactures	3,382	7,384	NA.
NONMETALS			
Abrasives, hard alloys	107	167	Romania 87; Poland 22; Bulgaria 17.
Asbestos	448,900	527,971	Poland 74,904; Japan 66,469; France 54,364; East Germany 44,731; India 35,391.
Cement, hydraulic thousand tons	3,300	3,593	Hungary 628; Libya 462; Czechoslovakia 454; Poland 402; Nigeria 262.
Clays and clay products:			
Refractory clays and baked slate	55,400	[1] 56,382	Poland 48,771; Hungary 7,611.
Refractory products including magnesite products	123,200	146,175	Cuba 25,178; Bulgaria 25,073; Romania 22,847.
Fertilizer materials:			
Crude phosphatic:			
Apatite ore thousand tons	25	[1] 22	All to East Germany.
Apatite concentrate do	6,600	6,995	East Germany 1,218; West Germany 914; Poland 768; Hungary 451.
Manufactured:			
Nitrogenous:			
Ammonia do	65	96	France 36; Poland 20; Cuba 13.
Urea do	318	540	India 204; Cuba 59; Iran 57; United States 55.
Other do	975	980	Cuba 256; Czechoslovakia 238; Yugoslavia 92.
Phosphatic do	493	518	Bulgaria 185; Cuba 151; Hungary 136.
Potassic do	4,800	5,580	Poland 2,148; Belgium 588; Hungary 535; Japan 443.
Fluorspar and related materials: Cryolite	2,000	[1] 1,028	Hungary 928; Yugoslavia 100.
Graphite [1]	2,388	--	
Gypsum [1]	r 21,735	67,866	All to Finland.
Salt	279,700	346,302	Czechoslovakia 101,456; Hungary 82,043; Denmark 81,500.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	31,200	31,669	Cuba 28,728.
Soda ash	64,300	54,996	Czechoslovakia 16,323; Turkey 16,263; Cuba 10,167.
Sulfur and pyrites:			
Pyrite, gross weight thousand tons	1,600	1,796	West Germany 509; Italy 361; Yugoslavia 217.
Sulfur, elemental	440,300	439,649	Cuba 146,804; Czechoslovakia 135,044; Hungary 78,358.
Sulfuric acid	160,800	161,518	Czechoslovakia 160,618.
Talc [1]	1,444	--	
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	75,500	80,308	East Germany 22,933; Bulgaria 19,048; Czechoslovakia 14,133.
Coal:			
Anthracite thousand tons	4,400	4,611	Bulgaria 2,108; France 1,151; Czechoslovakia 340.
Bituminous do	20,000	21,398	East Germany 4,020; Bulgaria 3,741; Japan 3,234; Czechoslovakia 2,409; Italy 1,484.

See footnotes at end of table.

Table 7.—U.S.S.R.: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coke ---- thousand tons--	4,800	4,633	Romania 1,175; East Germany 1,036; Hungary 656; Finland 597.
Gas, natural ---- million cubic feet--	r 241,269	495,780	Czechoslovakia 114,101; East Germany 102,412; West Germany 75,749; Poland 74,761; Austria 74,372.
Petroleum:			
Crude ---- thousand 42-gallon barrels--	626,955	592,101	Czechoslovakia 12.8%; East Germany 12.4%; Poland 10.2%; Bulgaria 9.3%; Finland 7.9%; Italy 6.8%; Cuba 6.6%; Hungary 5.8%; West Germany 5.5%.[3]
Refinery products:			
Gasoline ---- do----	46,750	49,138	
Kerosine and jet fuel ---- do----	17,825	20,104	
Distillate fuel oil ---- do----	105,932	117,935	
Residual fuel oil ---- do----	69,264	72,015	
Lubricants ---- do----	1,747	2,254	
Other:			
Liquefied petroleum gas [1] -- do----	1,266	1,273	
Paraffin ---- do----	462	609	
Asphalt and bitumen ---- do----	118	146	
Petroleum coke ---- do----	843	754	
Unspecified ---- do----	827	411	
Total ---- do----	245,034	264,639	
Crude chemicals from coal, gas and oil distillation ---- thousand tons--	454	482	West Germany 78; France 75; East Germany 62; Italy 61.

r Revised. NA Not available.

[1] Data possibly incomplete; total not officially reported. Total given represents sum of quantities reported under individual countries.

[2] Detail on principal destinations includes shipments of vanadium slag and manganese metal if any to the listed countries, but total shipments of these commodities are reported separately under vanadium and manganese in this table.

[3] Details on destinations of crude oil and various refinery products are not officially reported individually. Total exports of all crude oil and refinery products are reported on a gravimetric basis by destination, but cannot be converted to a volumetric basis owing to the varying specific gravities of the different products that constitute any country total. Percentage figures provided here are each country's share of total crude oil and refinery products on a gravimetric basis.

Table 8.—U.S.S.R.: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite ---thousand tons--	1,473	1,623	Yugoslavia 664; Greece 503; Guinea 253; Turkey 203.
Alumina ---do---	903	886	Hungary 323; Jamaica 143; Turkey 127; United States 85.
Metal and alloys, semimanufactures ---	2,000	2,545	Austria 807; West Germany 684; Czechoslovakia 224.
Antimony metal, unwrought [1] ---	1,412	1,304	Yugoslavia 1,204; People's Republic of China 100.
Cadmium metal, unwrought ---	248	264	Poland 186; North Korea 78.
Copper:			
Ore and concentrate [1] ---	r 31,520	19,036	All from Cyprus.
Metal, unwrought, unalloyed ---	6,100	4,880	United Kingdom 4,500.
Semimanufactures:			
Powder [1] ---	1,200	1,600	All from West Germany.
Rolled:			
Unalloyed ---	6,400	7,746	Yugoslavia 4,167; Switzerland 729.
Alloyed ---	7,200	10,271	Yugoslavia 2,472; Sweden 1,106.
Iron and steel:			
Scrap [1] ---thousand tons--	15	15	All from Mongolia.
Pig iron ---do---	333	139	India 63; North Korea 21.
Ferroalloys ---do---	19	30	Norway 16.
Semimanufactures:			
Pipe ---do---	r 2,028	2,180	West Germany 829; Italy 508; Japan 177; Romania 145.
Wire ---do---	7	9	NA.
Other, rolled only ---do---	r 3,180	5,410	West Germany 1,485; Japan 1,107; Belgium 785; Romania 272; France 259.
Lead:			
Ore and concentrate [1] ---	r 44,889	39,062	All from Iran.
Metal, unwrought ---	59,300	77,214	Yugoslavia 27,606; United Kingdom 18,456; North Korea 15,848.
Tin:			
Ore and concentrate [1] ---	5,831	2,710	All from Bolivia.
Metal, unwrought, unalloyed ---	4,039	5,235	Malaysia 2,561; United Kingdom 1,313; Bolivia 722.
Tungsten:			
Concentrate ---	4,823	7,044	People's Republic of China 3,900.
Middlings [1] ---	419	80	All from Mongolia.
Zinc:			
Ore [1] ---	r 26,881	33,159	All from Iran.
Concentrate [1] ---	r 17,781	--	
Metal:			
Unwrought:			
Unalloyed ---	44,800	48,694	Poland 38,853; North Korea 9,841.
Alloyed ---	3,926	3,595	All from Poland.
Semimanufactures:			
Dust ---	1,300	1,203	Do.
Rolled ---	6,900	12,584	North Korea 8,631; Poland 1,316.
Other metals:			
Unwrought ---	r 3,549	3,717	NA.
Semimanufactures ---	2,400	4,781	NA.
NONMETALS			
Barite ---	261,900	239,009	North Korea 100,074; Bulgaria 87,185; Yugoslavia 24,974.
Cement, hydraulic ---thousand tons--	544	489	North Korea 345; Mongolia 34; Afghanistan 33.
Clay products, refractory [1] ---	923	1,031	All from France.
Fertilizer materials, manufactured:			
Nitrogenous, ammonium nitrate [1] ---	15,200	15,004	All from North Korea.
Phosphatic ---	110,300	243,239	Sweden 111,152; United States 44,094.
Fluorspar ---	391,000	487,361	Mongolia 249,887; People's Republic of China 84,840; Japan 46,879.
Magnesite:			
Crude [1] ---	25,500	32,712	All from North Korea.
Powder ---	r 378,635	356,237	Do.

See footnotes at end of table.

Table 8.—U.S.S.R.: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Mica	160	725	All from India.
Quartz:			
Natural, for smelting [1] ---kilograms	394,000	1,220,000	All from Switzerland.
Piezoelectric [1] ---do	r 11,397	2,956	Do.
Salt [1]	r 99,360	100,658	All from People's Republic of China.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	173,500	209,176	Italy 57,357; Romania 47,568; Netherlands 37,443.
Soda ash	271,000	458,940	Bulgaria 255,329; Poland 97,926; Romania 68,900.
Caustic potash	4,100	5,326	West Germany 3,600; East Germany 1,296.
Sulfur	468,300	471,773	Poland 445,749; Canada 26,024.
Talc	44,900	[1] 72,742	North Korea 48,603; Bulgaria 24,139.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	1,000	1,928	East Germany 1,000.
Coal, bituminous ---thousand tons	r 9,972	9,712	All from Poland.
Coke ---do	666	677	Poland 674.
Gas, natural ---million cubic feet	r 403,094	421,867	Iran 321,150; Afghanistan 100,540.
Petroleum:			
Crude ---thousand 42-gallon barrels	98,264	32,459	Iraq 28,977; Syria 2,290; Egypt 1,192.
Refinery products:			
Gasoline ---do	4,519	4,113	Romania 45.7%; Poland 8.4%; Cuba 2.1%.[2]
Kerosine and jet fuel ---do	1,342	1,294	
Destillate fuel oil ---do	1,073	864	
Residual fuel oil ---do	2,776	558	
Lubricants ---do	803	678	
Other:			
Solvents ---do	203	176	
Paraffin ---do	24	--	
Unspecified ---do	622	340	
Total ---do	11,362	8,023	

r Revised. NA Not available.

[1] Data possibly incomplete; total not officially reported. Total given represents sum of quantities reported under individual countries.

[2] Details on origins of various refinery products are not officially reported individually. Total imports of all refinery products are reported on a weight basis by origin, but cannot be converted to a volumetric basis owing to the varying specific gravities of the different products that constitute any country total. Percentage figures provided here are each country's share of total refinery products on a gravimetric basis.

COMMODITY REVIEW

METALS

In 1975, metal output fell short of demand in the U.S.S.R. according to reports. Beneficiation and metallurgical facilities continued to experience low metal recovery principally from mixed ores of Kazakhstan and the Urals. Metallurgical plants frequently reported shortages in raw materials because of long lead times in scheduled new facilities for mining and processing. Despite these weaknesses, practically all metal commodity production expanded in 1975.

Aluminum.—The Soviet Union, second only to the United States in aluminum production, operated 14 primary reduction plants with a total probable annual capacity of 1.93 million tons by January 1976. Production in 1975 has been estimated at 1.68 million tons, including 150,000 tons of secondary aluminum. The estimated 7% increase in metal output was due mainly to new production from the Bratsk plant in East Siberia and the Regar plant in Tadzhikistan.

Under the 1971–75 plan, 1975 output was scheduled to be 50% to 60% over the 1970 level, or 2.1 million to 2.2 million tons. Production fell short of the planned increase because there were shortfalls at the Siberian plants, and output at the Regar plant started only in 1975. Under the 1976–80 plan, output in 1980 is scheduled to be 20% to 30% above the 1975 level.

In the Soviet Union, aluminum is produced more for export than domestic consumption. The U.S.S.R. exported more than 500,000 tons in each of the last 4 years (1972–75). Soviet aluminum exports are scheduled to increase from 368,000 tons in 1970 to about 700,000 tons in 1980. The U.S.S.R. exports primary and secondary aluminum to West European countries and Japan and plans to export large quantities of primary and secondary aluminum to the United States in the future.

Reportedly, the Soviet Union and Péchiney Ugine Kuhlmann were accelerating detailed negotiations for the 500,000-ton-per-year Sayanogorsk aluminum primary reduction plant in Krasnoyarsk Kray and the 1-million-ton-per-year Nikolayev alumina plant on the Black Sea. Financing, now estimated at $2,600 million, is to be provided by Péchiney and repaid with primary aluminum. Negotiations with Kaiser Aluminum & Chemical Corporation of the United States on the same project continued throughout 1975 with no firm agreement. Construction of the Sayanogorsk primary aluminum plant with the assistance of French experts began in 1975. The first potline is to be completed during 1976–80. Power is to be supplied from the Sayano-Shushensk hydroelectric plant, which is under construction.

Construction continued at the Bratsk, Krasnoyarsk, Irkutsk, and Regar primary aluminum plants. Three potlines were completed at the Bratsk plant in 1975, and design production capacity was attained without the final potline, which was still under construction in 1975. Production of aluminum at the Bratsk plant increased 91.5% during 1971–74 and 410% in the 1968–74 period.

The first potline at the Regar aluminum plant in the Gissar Valley in Tadzhikistan was commissioned in April and achieved design capacity in December. Construction started in 1964, and completion for the first potline was set for 1968. The second potline was under construction in 1975. Full operation was planned for 1977 but has been rescheduled for 1980. Regar operates on imported alumina. The output of aluminum at Regar is planned to increase 56% in 1976.

In comparison with the Bogoslovsk primary reduction plant, the production cost of metal was higher at Bratsk by 130%; Volkhov, 90%; Irkutsk, 30%; and Nadvoitsk and Volgogard, 20%.[54] The Krasnoyarsk plant reportedly produced low-quality metal, and many pots were idle in 1975.[55] Because of poor maintenance, many pots were also idle at the Irkutsk plant, especially at potline No. 7.[56] Production of primary aluminum at the Bogoslovsk plant in 1975 increased 10% over that of 1970.

A 10-day international exhibition on the production and use of aluminum was opened in Moscow on July 15 in conjunc-

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[54] Tsvetnye metally (Nonferrous Metals), Moscow. No. 6, June 1975, p. 5.
[55] Pages 4 and 7 of work cited in footnote 54.
[56] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 44, October 1975, p. 6.

tion with a scientific and technological symposium. A total of 120 firms and industrial organizations from Australia, Belgium, the United Kingdom, Hungary, East Germany, Italy, the Netherlands, the United States, France, West Germany, Switzerland, and Japan participated in the exhibition.

Although the Soviet Union is a large producer of low-grade bauxite, supplies are insufficient, and the U.S.S.R. is developing alumina production from nepheline and alunite. The Achinsk alumina plant in Krasnoyarsk Kray and the Pikalevo plant in Leningrad Oblast' produce alumina from nepheline. The 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. The Achinsk alumina-from-nepheline plant, which began operation in December 1971, showed very poor performance in 1975,[57] as did the Kirovobad alumina-from-alunite plant in Azerbaydzhan, which has been operated as a pilot plant for over 10 years with frequent changes of technology.

In 1975, attention was being paid to improving the raw material base and to erecting alumina facilities to overcome the gap between alumina and aluminum capacity. A serious deficit in alumina production seems probable in the future. The Soviet Union is also seeking to meet this deficit by integrating the aluminum industries of East Europe and by assisting projects in market economy countries—notably Greece, Guinea, and India. Meanwhile, the U.S.S.R. continued to import substantial quantities of high-grade bauxite and alumina from Hungary, Yugoslavia, Greece, Guinea, and elsewhere. Reportedly, the U.S.S.R. will build a 500,000-ton-per-year alumina plant in India. The $400 million project is to be financed by a loan from the Soviet Union and is to be repaid in alumina.

Bauxite remains the main raw material; nepheline and alunite are used in only small amounts for the production of alumina. Reserves of bauxite in the U.S.S.R. that are suitable for the production of alumina by the Bayer method are estimated at approximately 250 million tons, including some 65 million tons of proved, recoverable reserves. The principal reserves are situated on the eastern slope of the Urals, in the Turgay area of Kazakhstan, and in the Tikhvin region of Leningrad Oblast'. The northern Urals continue to be the main bauxite and alumina producing region. It is planned to increase production of alumina at the Bogoslovsk aluminum plant in the Urals in 1980 by 52.5% over that of 1975, using reserves of the Krasnaya Shapochka deposit.

The second largest bauxite (and alumina) producing region is Kazakhstan with the Pavlodar No. 1 alumina plant among the nation's largest in 1975. The No. 2 alumina plant was reportedly under construction. Since 1967, the Pavlodar plant has been processing bauxite containing 44.3% to 44.7% aluminum oxide instead of the planned 45.6%. Conversely, the iron oxide content was 16% to 17% compared with the expected 13.2% as called for in the plan. During 1971–75, production of alumina at the Pavlodar plant increased 25%. It is planned to increase alumina production in Kazakhstan 10% in 1980 over that of 1975. Production of alumina in this Republic in 1976 is to be increased 1.7% over that of 1975. Completion of development of the Krasnooktyabr'sk and Belinsk open pits in north Kazakhstan has been rescheduled for 1980. During 1971–75, production of alumina from imported bauxite in the Ukraine increased 15.2% and Ukrainian production of secondary aluminum increased 86.3%.[58]

Antimony.—Deposits of antimony occur at Kadamzhay in Kirgiziya, Dzhidzhikrut in Tadzhikistan, Turgary in Kazakhstan, and Sarylakh and Tazhdolinsk in Siberia. Kadamzhay remains the principal antimony center of the U.S.S.R. The second stage of this complex was under construction in 1975 and was scheduled for completion in 1976. Construction of the second stage of the Aznob mining and concentrating combine (Dzhidzhikrutskiy complex) in Tadzhikistan continued slowly in 1975. In 1973, the Ministry of Nonferrous Metallurgy planned for 9 million rubles to be allocated to the construction of this project in 1974 and 10 million rubles in 1975. Actually, 4.7 million rubles was allocated in 1974 and

[57] Page 6 of work cited in footnote 54.
[58] Ekonomika Sovetskoy Ukrainy (Economics of the Soviet Ukraine), Kiev. No. 11, November 1975, p. 12.

5.6 million rubles in 1975.[59] The Savoyardy antimony deposit in Kirgizia and the Skal'noye deposit in Tadzhikistan were under preliminary exploration in 1975.

Arsenic.—Arsenic reserves were estimated at about 12 million tons with an average As_2O_3 content of 0.2% to 2.5%. All output in 1975 was obtained as a byproduct from the smelting or roasting of metallic ores.

Beryllium.—The Soviet Union is one of the world's largest producers and consumers of beryl and beryllium alloys and metal. The production of these commodities is being increased rapidly. During 1971–75, estimated output increased about 23%. The increase indicated a probable production level of 1,600 tons of beryl (10% to 12% BeO) in 1975.

Bismuth.—As in previous years, bismuth was produced in 1975 almost entirely from complex ores, such as tungsten-molybdenum-bismuth ores of the North Caucasus, and scheelite and cassiterite ores of Kazakhstan and Siberia. Recovery of metal in concentrate was less than 50% of the metal contained in ores, and recovery in metallurgical process was about 88%. In 1975, bismuth was not recovered from Armenian and other complex ores.

Cadmium.—Cadmium was produced at various Soviet lead and zinc smelters as a byproduct. Kazakhstan recently became an important producer of cadmium. The Leninogorsk polymetallic complex in Kazakhstan, which produced the first Soviet cadmium in 1935 and the first electrolytic cadmium later, continued to be one of the largest producers. During 1971–75, the recovery of cadmium at this complex increased 4.5%. Average overall Soviet cadmium recovery was about 60%.

Chromium.—With an estimated output of 2.08 million tons, the U.S.S.R. was the leading world chrome ore producer and exporter in 1975. Chrome ore output in 1975 had been expected to be about 18% higher than in 1970. The planned goals were reportedly exceeded by 1%. Exports totaled 1.17 million tons in 1975, with about 80% going to Western countries. Except for the chemical-grade product going to Italy, virtually all the Soviet chromite shipped to Western countries is for metallurgical production. Output of chromite is expected to be 2.3 million tons in 1980. Approximately 60% of the total production is to be exported.

Chromite ores are located in Kazakhstan and in the Ural Mountains. Gross reserves (measured, indicated, and inferred) were estimated at over 100 million tons containing 15% to 63% Cr_2O_3, of which 20 million to 24 million tons are measured. About 94% of the total reserves are situated in Kazakhstan with the balance in the Ural Mountains. There are over 20 deposits in Aktyubinsk Oblast' in western Kazakhstan of which Molodezhnoye, Millionnyy, and Almaz-Zhemchugina are the largest with total gross reserves of some 60 million tons. The Donskoye mining administration at Khrom-Tau in Aktyubinsk Oblast' of Kazakhstan, which produces over 90% of the Soviet output, is the only supplier of high-quality ore. Deposits of 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.

Most ores can be shipped without beneficiation, other than hand picking. The first Soviet chromite concentrator with an annual capacity of 1 million tons (300,000 tons of concentrate) was under construction at Donskoye. The first section went into operation in 1974, and completion is scheduled for 1980. The new mill will process lower grade ores that hitherto have been stockpiled. Development of the first underground mine, the 40 Let Kazakhskoy SSR-Molodezhnoye, with an annual capacity of 2 million tons of crude ore, continued at Donskoye and is scheduled for completion in 1980.

Reportedly, Soviet chrome ore was selling for $135 to $149.50 per ton, f.o.b. Black Sea ports, for the 48% Cr_2O_3 ore with a 4:1 iron ratio.

Cobalt.—In 1975, cobalt was produced at Norilsk in West Siberia; at Monchegorsk and Pechenga on the Kola Peninsula; and in the Urals at the Yuzhuralnikel, Ufaley, and Rezhsk nickel plants. Cobalt production increased 16% between 1970 and 1975. Only some 25% of the cobalt in slag was recovered. Average total recovery was about 55%. The planned production cost of cobalt in concentrate at the Pechenganikel complex was 6,780 rubles per ton in 1975.

Copper.—In 1975, the Soviet Union produced an estimated 925,000 tons of blister copper, including 160,000 tons of

[59] Page 5 of work cited in footnote 56.

secondary copper. An estimated 2.8% increase in metal output was due to increased production of blister copper from the new facilities which were commissioned in 1974. Ten percent of total production of primary copper was recovered as byproduct.[60] The 1971–75 plan scheduled Soviet copper output to rise 35% to 40% to a probable planned level of 960,000 to 995,000 tons of primary and secondary copper by 1975, but actual output was 5% to 10% lower. Under the new 5-year plan, output in 1980 is scheduled to be 20% to 30% over the 1975 level. If the 20% growth is achieved, the U.S.S.R. will produce 1.1 million tons of primary and secondary copper by 1980. This might allow more "surplus" for exports, which increased from 123,100 tons in 1970 to 205,600 tons in 1975. Exports in 1980 are estimated to reach 350,000 tons.

Kazakhstan continued to be the main center of copper production, and the Balkhash complex was the largest producer in the country. During 1971–74, 415 million rubles was spent on development of the Kazakhstan copper industry, and production of refined metal increased 50%. The 1976–80 plan calls for a 25% increase in refined copper production in Kazakhstan. It is planned to increase refined metal production 6% in 1976 compared with the 1975 level. In April 1975, the first stage of mine No. 65 at the Dzhezkazgan complex was commissioned, but equipment problems resulted in lower production than originally planned. Development of the second stage of this mine has proceeded slowly.[61] Development of the small Sayak-III open pit at the Balkhash complex was completed in 1975. Shortage of copper ore was experienced at the Balkhash and Dzhezkazgan complexes.[62]

Development of the Akchu-Spassk and Dzheladinsk mines continued, and that of a new mine began in 1975 at the Irtysh polymetallic complex in East Kazakhstan Oblast'. It is planned to complete construction of the Kargalinsk and Orlovsk mining and concentrating complexes by 1980. Development of mine No. 65 at the Dzhezkazgan complex and enlargement of the Tishinsk and Annensk mines are also to be completed by 1980. It is planned to begin construction of the Boshchekulsk and Chatyrkulsk mining and concentrating complexes in Kazakhstan in 1976. Completion of the first stage is planned for 1980. Exploration of the Saryoba, Intauz, Kirshakpay, and Karashoshak deposits in the Dzhezkazgan region continued in 1975.

The Urals was the second largest copper-producing region, but the Krasnouralsk, Kirovograd, and Karabash copper smelters in the Northern Urals experienced a major shortage of concentrates. The existing pyrite deposits no longer met the needs of the smelters, and one-third of total smelter consumption of concentrate was being shipped from Central Asia, the Altay Region, the Caucasus, and other regions.[63] Transport costs exceeded 10 million rubles per year. The imbalance between smelting and mining in the Urals resulted from a prolonged lag in exploration[64] and development of mines.[65] For example, development of the Volkov mine, which began in 1965, is scheduled for completion in 1980.[66]

During 1971–74 output of blister at the Kirovograd plant in the Urals increased 29.6%. During the same period, ore production at the Gaysk copper mining and concentration complex at Orenburg Oblast' increased 23.4%. The fourth stage of an underground mine at this complex is to be commissioned in 1976. A mine is to be developed at the 50-letiye Oktyabrya copper deposit in Orenburg Oblast'. At the Bashkir copper-sulfur complex, additional ore-processing facilities were completed in 1975.

The second stage of the Madneuli mining and concentrating complex in Georgia was commissioned in November 1975, and the complex is to be completed in the 1976–80 period. In 1976, copper ore extraction at this complex is to be increased 130% over that of 1975. Development of the Sary-cheku copper mine at the Almalyk complex in Uzbekistan was completed in 1975. The copper content in slag

[60] Pravda, Moscow. July 9, 1975, p. 2.
[61] Kazakhstanskaya pravda, Alma-Ata. Aug. 23, 1975, p. 2.
[62] Kazakhstanskaya pravda, Alma-Ata. July 10, 1975, p. 3.
Sotsialisticheskaya industriya (Socialist Industry), Moscow. Jan. 29, 1976, p. 2.
[63] Pravda, Moscow. Nov. 16, 1975, p. 2.
Sotsialisticheskaya industriya (Socialist Industry), Moscow. June 25, 1975, p. 2.
[64] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Dec. 28, 1973, p. 2.
[65] Work cited in footnote 64.
[66] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Nov. 4, 1975.
Work cited in footnote 64.

of the flash-smelting unit at this complex was 1%, compared with a designed 0.5%; smelting rates of 10 tons of concentrate per square meter per day have been achieved, compared with a planned 12 tons.[67]

Recovery of copper in concentrate at the Sorskiy copper-molybdenum complex increased from 38.7% in 1972 to 45.93% in 1974. The production cost of copper in concentrate at the Pechenganikel complex on the Kola Peninsula was 455 rubles per ton in 1975.

Three Finnish firms were building copper and nickel smelters at the Norilsk complex. Reportedly the cost of the plants, with an annual capacity of 550,000 tons of nickel concentrate and 650,000 tons of copper concentrate, is to be $300 million. The Outokumpu flash-smelting technology will be used. At the Severonikel complex at Monchegorsk on the Kola Peninsula, a copper electrolysis plant was under construction in 1975, and its completion has been rescheduled for 1976. Development of the Erdent copper-molybenum complex in Mongolia continued in 1975. More than 3,000 Soviet technicians and workers were employed at this project in 1975.

Development of the Udokan copper deposit in East Siberia during 1976–90 is expected to require a capital investment of about 2 billion rubles. During a Moscow exhibition-seminar on copper ore processing in 1975, Soviet officials asked the United States and other Western countries to submit a proposal to build a pilot plant at the Udokan copper deposit to process 100 tons per day of ore. Reportedly, Rio Tinto-Zinc Corp., Ltd., (RTZ) has submitted a detailed proposal for this pilot plant.

The discussion on participation of Western companies in the development of the Udokan deposit continued in 1975. RTZ is interested in playing a major role in the development of this proposed 400,000-ton-per-year copper project.

Reportedly, agreements have been exchanged between the U.S.S.R. and India on the development of copper deposits at Malanjkhand and Madhya Pradesh. The Soviet Union has offered to supply earth-moving equipment to India.

Gold.—In 1975, the U.S.S.R. produced an estimated 7.5 million troy ounces of gold and was the world's second largest producer. The growth in Soviet gold production reportedly resulted mainly from expansion of placer mining in the northeast of the Asian part of the country. Over two-thirds of the total output came from the Soviet Far East and East Siberia; most of the balance came from gold and polymetallic ores in the Urals, Kazakhstan, Armenia, and Uzbekistan.

Prompted by the higher international prices, the Soviet Union planned to increase production and is importing large-scale equipment from West Europe, the United States, and Japan. Gold production is estimated at 8.6 million troy ounces for 1980.

There are no accurate figures, but according to some estimates, the U.S.S.R. sold less than 4.5 million troy ounces of gold in 1975 compared with 7.3 million troy ounces in 1974. At the beginning of 1975, the Soviet Union was a heavy seller of gold in its effort to raise foreign exchange to pay for grain purchased, but as prices of gold declined at yearend, the Soviet Union became a fairly heavy seller of platinum-group metals.

The inspectorate of the assay office of the Administration of Precious Metals of the U.S.S.R. Ministry of Finance exercises control over all industrial facilities in the Soviet Union which use precious metals in their production. In the U.S.S.R. the following gold purity standards were established for items of general use: 958, 750, 583, 500, and 375. This means that every 1,000 parts of alloy must contain the indicated number of parts of gold.

Potential reserves of gold in lode and placer deposits were estimated at about 200 million troy ounces in 1970. Measured reserves were reportedly sufficient for a 16- to 17-year operation at the current production rate. Extensive prospecting for gold continued in many regions of the Asian part of the country, but the amount of gold discovered was less than the quantity produced in 1975.[68] Several new small deposits were found in the Soviet Far East and Yakutia in 1975. Two new small deposits were prospected at the Baleyzoloto complex in Chita Oblast'. At the Maykan gold mining complex in Pavlodar Oblast' in Kazakhstan, several new

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[67] Tsvetnye metally (Nonferrous Metals), Moscow. No. 10, October 1975, p. 6.
[68] Page 17 of work cited in footnote 26.

small deposits were discovered in 1975. The Kedrovsk gold deposit in the north of Buryat A.S.S.R., near the route of the BAM railway, was approved for development.

Magadan Oblast' was the main production center with 32 placer mines, 23 dredges, and over 500 sandwashing rigs. The Severovestokzoloto (Northeastern gold) Association of Magadan Oblast' fulfilled only 87% of its 1975 gold production quota. Overall profitability and return on capital had fallen, and labor productivity increased only 7.8% in 1971–74. The Association's mining enterprises had extensive unplanned idling of washing installations, bulldozers, and dredges in 1975. The poor operations of some placers during the washing season were attributed to the inadequate training of bulldozer operators. Owing to their lack of experience with large imported earthmoving equipment, there was excessive downtime according to reports. Nearly 70% of all machinery made for the mining industry in Magadan Oblast' is produced to the Severovestokzoloto Association design bureau's specifications.

In 1971–75, industrial output in Magadan Oblast' increased 12.8%. Capital investment in the development of the Oblast's economy amounted to 2,360 million rubles. More than 520 million rubles was allocated for prospecting and exploration of gold, tin, silver, tungsten, and coal deposits. The 5-year plan for increasing reserves of placer and lode gold was not fulfilled. The Anyuysk Expedition was the only one among all expeditions to fulfill its 1971–75 planned quota. Allocations for geological prospecting are to increase almost 50% in the tenth (1976–80) 5-year plan period. It is planned to increase peat stripping 21%, underground sand excavation 3.9%, and volume of sandwashing 10.5% in Magadan Oblast' in 1976 compared with the 1975 level.

In Yakutia, the second largest gold-producing region, the Lenzoloto Trust was the leading gold-dredging enterprise in the Soviet Union. The deepest shaft (890 meters) in the Soviet gold mining industry was under development at the Bestube mine in Tselinograd Oblast' in Kazakhstan. At the lead-zinc concentration plants in Kazakhstan, the losses of gold amounted to 25%.[69]

Iron Ore.—In 1975, 71 underground mines and 63 open pits, with a total capacity of over 265 million tons, produced 233 million tons of usable ore (direct-shipping ores plus concentrates), an increase of 8 million tons over 1974 production. About 82% of production was from open pit operations. The intensive growth of open pit mines follows the commissioning of five large taconite complexes in Krivoy Rog, the Ukraine. By 1980, the output of crude ore is planned to reach 550 million to 575 million tons. It is estimated that production of usable ore will reach 241 million tons in 1976 and 275 million tons in 1980.

Exports of iron ore increased from 36.1 million tons in 1970 to 43.6 million tons in 1975. The principal increase was in exports to Bulgaria, Hungary, East Germany, Romania, Poland, and Czechoslovakia, which total about 90% of exports.

Finnish companies were building the Kostamus iron ore complex in Soviet Karelia about 30 kilometers from the Finnish border. This project is to be built in three stages and is to have an annual capacity of about 8.3 million tons of pellets (24 million tons of crude ore). Preliminary estimates show that the entire project will cost about $600 million. The construction is to take from 8 to 10 years. In 1975, there were about 320 Finnish workers working on the Kostamus project on Soviet territory.

Reportedly, the Soviet Union and Czechoslovakia have signed a long-term contract on cooperation in the development of the Soviet iron ore industry. Czechoslovakia will supply the U.S.S.R. with machinery and equipment. The Soviet Union will repay in iron concentrates and ferromanganese. During 1976–80, Bulgaria is to take part in the construction of a number of iron ore mining and concentrating enterprises in the U.S.S.R.; in return, it is to be supplied with iron concentrates. There were over 2,000 Bulgarians working at the construction of the Lebedi ore-concentrating complex at Gubkin in Belgorod Oblast'.

Capital investment in Soviet iron ore mining for 1971–75 was set at 4,300 million rubles, 66% more than was invested during the preceding 5-year period. Annual production capacity of crude ore

[69] Tsvetnye metally (Nonferrous Metals). Moscow. No. 4, April 1975, pp. 77–79.

increased by 27.5 million tons in 1975, compared with a planned increase of 45.0 million tons. The following facilities were commissioned in 1975: The first and second stages of the Lebedi pelletizing plant in Belgorod Oblast', with a total annual capacity of 4.3 million tons; additional facilities for processing 3.5 million tons of crude ore and producing 0.6 million tons of concentrate at the Kachkanar complex in Kazakhstan; a new section of the concentrator at the Novokrivorozhskiy complex in the Ukraine, with an annual capacity of 1.4 million tons of concentrate; an open pit with an annual capacity of 6 million tons of crude ore at the same complex; a production facility of 0.5 million tons at the Dneprovsk complex in the Ukraine; the first section of the 2.5-million-ton-per-year crude ore underground mine at the Sokolovsk-Sarbaysk complex in Kazakhstan; and the first stage of the Irbin mine in West Siberia. The Lebedi pelletizing plant is the fifth pelletizing plant in the U.S.S.R.

Completion of the first stage of the Krasnokamskiy mine in Krasnoyarsk Kray with an annual capacity of 0.6 million tons was rescheduled for 1976. Construction of the Stoylensk complex in the Kursk Magnetic Anomaly area and the Kagarsk complex in Kustanay Oblast' in Kazakhstan began in 1975. The total capacity of the Kagarsk complex is to be 21 million tons of crude ore. The first stage is to be completed by 1980. Plans for the enlargement of the Olenogrosk complex on the Kola Peninsula were approved in 1975.

Ninety-two concentrators, 20 with sintering and 5 with pelletizing facilities, produced 151 million tons of sinter and 27.2 million tons of pellets in 1975. The average iron content was 59.3% in usable ore (including concentrate) and 32.3% in the ore shipped for upgrading.

Iron ore production in the U.S.S.R. is shown in the following tabulation:

	1950	1960	1970	1974	1975
Crude ore .... million tons..	48.2	141.9	355.1	455.2	472.0
Usable ore .... do....	36.6	105.8	195.5	224.9	233.0
Iron content in usable ore .... percent..	55.7	54.4	58.7	59.3	59.3
Surface mining .... do....	44.4	57.1	78.4	81.5	82.0
Underground mining .... do....	55.6	42.9	21.6	18.5	18.0

Sources: Gornyy zhurnal (Mining Journal), Moscow. No. 7, July 1975, pp. 6–15. Stal' (Steel), Moscow. No. 6, June 1975, p. 569.

A contract for the second iron ore pelletizing plant in the Ukraine has been received from the U.S.S.R. by Allis Chalmers Co. This plant is to be similar to the first one under construction at the Dneprovsk complex near Kremenchug in the Ukraine. The cost of the 6-million-ton-per-year pellet plant is $52 million. Completion is scheduled for 1978.

Output of Soviet sinter and pellets follows:

	1965	1967	1968	1970	1973	1975
Sinter .... million tons..	111.3	123.1	128.2	137.8	148.8	151.9
Iron content .... percent..	52.0	53.1	53.4	53.5	53.5	53.9
Pellets .... million tons..	.3	2.9	7.2	10.6	21.5	27.2
Iron content .... percent..	59.8	62.5	61.3	60.6	61.8	61.8

Sources: Stal' (Steel), Moscow. No. 6, June 1975, p. 572. United Nations Economic Commission for Europe Steel. WP.1/R.4/Add.6.p.3, May 7, 1976.

The iron content of pellets at four Soviet plants follows:

	Percent
Sokolovsk-Sarbay, Kazakhstan	64.8
Kackanar, Kazakhstan	58.5
Tsentral'nyy, Krivoy Rog	58.7
Severnyy, Krivoy Rog	60.4

Source: Metallurgiya i gornorudnaya promyshlennost' (Metallurgy and Metal Mining Industry), Dnepropetrovsk. No. 4, April 1975, p. 8.

The Ukraine produced over 55% of Soviet iron ore, and the Krivoy Rog Basin produced 89% of the Ukraine's total in 1975. The Urals was the second largest producer, followed by Kazakhstan, the Kursk region, Siberia, and the Kola Peninsula. According to Soviet calculations, because of the shortage of iron ore (50% of consumption) in the Urals, the shipment of iron ore to the Urals will increase from

17 million tons in 1975 to between 18 million and 20 million tons by 1980. The annual cost of shipment will amount to 120 million rubles.[70] Iron ore was being shipped from Krivoy Rog, the Kola Peninsula, and the Kursk region to the metallurgical plants in the Urals. Shipment took 6 to 8 days by railway.[71] Excavators at the Soviet iron ore open pits were idle 40% to 75% of the time.[72]

In 1975, there were three mining enterprises in Belgorod Oblast': The Kursk Magnetic Anomaly Ore Combine (KMAruda), the Lebedin mining and concentrating complex, and the Stoylensk complex (under construction). These enterprises produced about 22 million tons of usable ore in 1975. The Yakovlevo mine in this Oblast' was under development in 1975. The Kursk Magnetic Anomaly area (Belgorod Oblast' and Kursk Oblast') produced an estimated 35 million tons of usable iron ore in 1975.

Iron and Steel.—The Soviet iron and steel industry held first place in the world in total quantity of iron ore mined and coke, refractories, crude steel, ferroalloys, and steel pipe production in 1975. However, the Soviet steel industry results relate to quantity based on total overall tonnage. The plan for production of metal is annually increased by a specific quantity, expressed in tons, regardless of the assortment and length and weight of the products. Tonnage is also used in evaluating the work of rolling shops and workers. Each year the plan for rolling steel is overfilled, and at the same time millions of tons of rolled products are not delivered to consumers. It must be assumed that the first concern of the management of Soviet enterprises is the achievement of production goals. A great portion of rolled products consists of sizes and shapes that are not in large demand. Such practices increase actual metal consumption and are wasteful. Thus, the shortage of particular steel products causes the U.S.S.R. to import large quantities of plate and sheet steel and steel pipe from Western countries.[73]

The advance of the iron and steel industry of the U.S.S.R. in terms of quantities produced was not matched by an advance in technology. The lag in the technical level of production facilities is characterized by obsolescence of equipment and low efficiency. The mechanization of production processes could be greatly improved. One area of potential improvement cited by press reports was the use of low-grade sinter in Soviet metallurgy. Another area was the siting of steel plants at great distances from the source of raw materials, thereby incurring additional transportation costs. In 1975, the Magnitogorsk complex in the Urals smelted more than 15 million tons of crude steel. The complex accounts for more than 11% of the output produced by the country's ferrous industry. The blast furnaces and open hearth furnaces were experiencing an acute shortage of oxygen. Only 7 out of 10 blast furnaces were operating with oxygen. The problem of providing the complex with iron ore has not been solved.[74]

The general level of iron and steel technology in the U.S.S.R. has lagged behind that of the more advanced Western countries. New technology, introduced and proved in the Western countries, has been accepted and applied in the U.S.S.R.[75]

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 was consuming much less steel per capita than West Europe in 1975, because growth was 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 persist.

A careful and exhaustive study of Soviet publications shows that only about 45% of total crude steel production is efficiently used in the Soviet economy; 55% is remelted or lost.

In 1975, 36 enterprises, operating 137 blast furnaces, produced 103 million tons of pig iron, a 3% increase over 1974 out-

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[70] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 5, January 1976, p. 9.
Pravda, Moscow. Jan. 4, 1976, p. 3.
[71] First work cited in footnote 63.
[72] Gornyy zhurnal (Mining Journal), Moscow. No. 8, August 1975, p. 48.
[73] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 4, January 1975, p. 2.
Material'no-tekhnicheskoye snabzheniye (Material-Technical Supply), Moscow. No. 3, March 1974, p. 48.
Pravda, Moscow. June 21, 1974.
Rabochaya gazeta (Workers' Gazette). Kiev. Dec. 22, 1971, p. 3.
[74] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 1, January 1976, p. 7.
[75] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Oct. 23, 1975, p. 1.

put. Their estimated output for 1976 and 1980 is 107 million tons and 120 million tons, respectively. Average blast furnace capacity (useful volume) was reported at about 1,200 cubic meters. About half of all blast furnaces used oxygen for enrichment; some 85% of the pig iron was being produced by partial use of natural gas injection and oxygen enrichment at 110 blast furnaces. The construction of a 3,000-cubic-meter blast furnace at the Kommunar plant in Voroshilovgrad Oblast' in the Ukraine began in March 1975. Completion is scheduled for 1976. Six old blast furnaces are to be replaced by new 5,000-cubic-meter blast furnaces at the Magnitogorsk complex. Because of basic raw material deficiencies, the productivity of the Soviet blast furnaces was low.[76]

Crude steel production from 76 metallurgical works increased 4% to 141 million tons in 1975. Plans call for the production of 147 million tons of crude steel in 1976, and 168.5 million tons in 1980. Electric steel production was characterized by lower capacity furnaces and power transformers. The largest size of the electric furnaces was 100 tons, and that of transformers was 25,000 kilovolt-amperes. Distribution of steel production by process, in percent, follows:

Process	1960	1965	1970	1972	1973	1974	1975
Open hearth	84.4	88.0	72.6	68.7	67.8	66.6	64.8
Oxygen converter	3.8	5.0	15.3	20.5	21.4	22.7	24.6
Electric steel	8.9	4.9	10.7	9.8	9.9	9.9	9.9
Bessemer	2.9	2.1	1.4	1.0	.9	.8	.7

In 1975, the Soviet Union produced 98.6 million tons of finished rolled steel products, an increase of 5% over 1974 output. It is planned to produce 103 million tons in 1976 and 117.5 million tons in 1980.

In 1975, production of rolled steel in the U.S.S.R. was regulated by 480 State standards. Requirements of 32 standards were not being met because of the lack of the necessary equipment and finishing and heat-treatment facilities. Therefore, the Ukrainian ferrous industry in 6 months of 1975 was 2.5 million rubles short in the delivery of high-quality products to the Soviet economy.[77] To stimulate the production of small, labor-intensive, and economically effective types of products and shape sizes, starting on January 1, 1976, increased product prices will be introduced.

It had been expected that during the 1971–75 5-year period, the ferrous industry would have been able to produce 315 types of hot-rolled and about 200 types of cold-rolled shapes and also about 300 new grades of steel.[78] Actually, during 1971–75 the Soviet ferrous industry started up production of 128 hot-rolled assortments and 97 cold-rolled shapes.[79]

Production facilities—either new, expanded, or renovated—commissioned during the year (in million tons) follow: Pig iron, 1.8; crude steel, 4; and finished rolled ferrous metals, 3.3. The following main facilities were put into operation: The new blast furnace No. 4 at the Karaganda complex in Kazakhstan, the renovated unit No. 4 at the Lenin plant in Krivoy Rog and No. 4 at the Azovstal' plant in the Ukraine; oxygen converter shop No. 2, with an annual capacity of 4 million tons, at the Novolipetsk plant; the "2,000" wide-strip mill, with an annual capacity of 3 million tons, at the Cherpovets plant; the second stage of the transformer steel shop at the Verkh-Isetsk metallurgical plant; and a new shop at the Sinarsk steel pipe mill in the Urals. There were 14,000 workers on the construction of the No. 4 blast furnace at the Karaganda plant.[80] The total volume of capital investments in the ferrous industry in the ninth 5-year period (1971–75) was almost 40% higher than that during the 1966–70 period. In 1976 it is planned to invest 10% more than in 1975.

Technical plans for the first stage of the Oskol iron and steel works have been drawn up. The complex is to be built near the Oskol electrometallurgical works, which was already under construction by

[76] Pravda, Moscow. Oct. 16, 1975, p. 2.
[77] Metallurgiya i gornorudnaya promyshlennost' (Metallurgy and Metal Mining Industry), Dnepropetrovsk. No. 5, September/October 1975, pp. 1–3.
[78] Trud (Labor), Moscow. Dec. 12, 1975, p. 2.
[79] Work cited in footnote 77.
[80] Kazakhstanskaya pravda, Alma-Ata. Nov. 6, 1975, p. 2.

West German firms. The first stage of the Oskol plant is to include two 5,000-cubic-meter blast furnaces, an oxygen converter shop, and a conveyor line for production of finished slabs, which will be shipped to the COMECON countries.

In terms of tonnage the Soviet Union was the largest world producer of steel pipe, with a total of 16 million tons in 1975, a 7% increase over 1974 production. The quality of the pipe produced in the U.S.S.R. is poor and does not correspond to the State standards. Moreover, fabrication was inadequate for internal demand, and some 10% of requirements had to be imported from West Europe and Japan. About 60% of the total Czechoslovak pipe production goes to the U.S.S.R. During 1971–75, the annual production capacity of the Chelyabinsk pipe works was increased by 0.5 million tons. The pipe made at the plant was intended for gas transmission lines. Production of welded steel pipe began at the repair and engineering works of the Zima electrochemical complex in Irkutsk Oblast' in East Siberia in October 1975. It was planned to put 0.425 million tons of new capacity into operation in 1975.

The U.S.S.R. was signing contracts for new Western technology and machinery to increase its steel output and upgrade steel products, especially the modernization of mills for the production of tinplate, steel sheet, and electric steel. In 1974, for example, the Soviet Union purchased 249.7 million rubles worth of metallurgical equipment, compared with 133.1 million rubles in 1973. About one-half of these purchases involved rolling mills. Along with COMECON countries (Hungary, East Germany, Poland, and Czechoslovakia), rolling equipment was imported from the United Kingdom, West Germany, and France. Purchases from East Germany tripled in 1 year. Two West German companies, Korf Stahl of Dusseldorf and Salzgitter Industriebau, are to supply an integrated iron and steel complex (5 million tons of sponge iron and 3 million tons of rolled steel per year) at Staryy Oskol in Belgorod Oblast'. The Oskol iron and steel complex is to have electric furnaces with total annual production capacity of about 3.5 million tons of steel. More than 4,000 workers were employed on the construction of the Staryy Oskol electrometallurgical plant in 1975. The first stage of this project is to be completed by 1980. The U.S.S.R. is to import two Sendzimir cold-rolling mills, to be installed in the Chelyabinsk and Sverdlovsk plants.

Iron and steel plant construction accounted for 22% of Soviet foreign economic and technical assistance to centrally planned economy and developing countries. The U.S.S.R. has signed agreements for 88 steel plants, of which 46 are already in operation.

Lead and Zinc.—With estimated output of primary lead at 480,000 tons and zinc at 690,000 tons, the U.S.S.R. was probably the world's second largest producer in 1975. Estimated production of primary metals in 1980 is placed at 530,000 tons of lead and 740,000 tons of zinc. Exports of lead increased from 92,400 tons in 1970 to 95,500 tons in 1974 and to 98,900 tons in 1975, and zinc exports rose from 95,100 tons in 1970 to 100,600 tons in 1975. Neither lead nor zinc output quotas were reached in 1975 or in previous years, owing to ore shortages, slow construction of new facilities, and low metal recoveries.[81] Many mines of the Soviet lead and zinc industry did not attain their production capacities.[82] Over 10% of total lead and zinc production was recovered as byproduct in 1975. During 1971–75, production of secondary lead in the Ukranian S.S.R. increased 35.7%.[83]

At the Chimkent lead plant in Kazakhstan, a slag-processing unit has been installed to process 40 years of accumulated slag and to recover zinc, lead, and other metals. One blast furnace at this plant was modernized in 1975, and lead output there is to be increased 5% as a result. The sinking of a main shaft and a ventilation shaft, both 800 meters deep, at the Nikolayevka polymetallic deposit of the Far Eastern mining and metallurgical complex in Primorskiy Kray was completed in October 1975. The Ozernyy lead-zinc mining and concentrating complex in Buryat A.S.S.R. was under construction in 1975. The first stage of the complex is to be put into operation in 1982. Construction of the Zharemsk lead-zinc-barite

[81] Tsvetnye metally (Nonferrous Metals), Moscow. No. 9, September 1974, p. 10.
[82] Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 8, August 1975, p. 4.
[83] Work cited in footnote 58.

mining and concentrating complex in Kazakhstan began in 1975.

Exploration of the Suvenir and Zhelandy polymetallic deposits in Kazakhstan has been completed, and development is to begin in 1976. The Sardana polymetallic deposit in Yakut A.S.S.R. and the Uchkulach deposit in Uzbekistan were under exploration in 1975.

Kazakhstan continued to be the leading lead and zinc producer, and output there is to be increased 13% and 9%, respectively, during 1976–80. At many concentrating plants, the recovery of metals was low. For example, at the Dzhezkazgan concentrator, where copper-lead-zinc ore is treated, recovery of metals in 1974 in percent was as follows:

	Planned		Actual	
	Copper	Lead	Copper	Lead
Copper concentrate:				
Content	30.61	3.89	21.02	4.33
Recovery	90.0	13.80	86.45	24.23
Lead concentrate:				
Content	4.0	50.0	8.28	44.41
Recovery	3.6	74.0	5.7	63.78

Source: Tsvetnye metally (Nonferrous Metals), Moscow. No. 11, November 1975, p. 73.

Employees have worked 12- to 14-hour shifts on weekends on the construction of the metallurgical shop at the Achisay complex in Kazakhstan. [84]

In the Urals, the second largest zinc-producing region, the problem of zinc and gold recovery from the copper-pyrite ores was still unsolved. Recovery of zinc in concentrate at concentration plants in this region amounted to only 50% to 60%. Slow development of the mines at the Adrasman Lead and Zinc Combine resulted in shortages at the concentration plant. The Vostochnyy Kanimansur mine, under development for 5 years, reported in 1975 that only 20% of programed costs were spent.[85] The same was true for the Far East mining and metallurgical complex in Primorskiy Kray [86] and the Almalyk complex in Uzbekistan.[87] The shortage of qualified workers and worn out equipment resulted in poor performance of the Elektrotsink zinc plant in the North Caucasus.[88]

Magnesium.—Five magnesium plants with an estimated combined annual capacity of 70,000 tons produced some 63,000 tons in 1975, 5% more than in 1974. Exports of metal decreased from 27,900 tons in 1974 to 11,400 tons in 1975. Production and consumption of rolled metal in the Soviet Union was small.[89] Since 1973 the Solikamsk magnesium plant has been part of the Berezniki titanium-magnesium complex.

Manganese.—The Soviet manganese industry remains the largest in the world; estimated output of marketable ores was 8.8 million tons in 1975, or 3% over that of 1974. Over 70% of the total production came from the Nikopol Basin in the Ukraine; next largest was the Chiatura Basin in Georgia. Small amounts of manganese were produced at the Dzezdinsk and Atasuysk mines in Kazakhstan. Exports of manganese ore increased from 1.2 million tons in 1970 to 1.41 million tons in 1975. Estimated production of marketable ore in 1980 is placed at 10 million tons.

In the Nikopol Basin in Dneprovsk Oblast' in the Ukraine, 80% of production is surface-mined and the remainder is deep-mined. The second stage of the Marganets mining and concentrating complex at the Nikopol Basin (annual capacity, 600,000 tons of crude ore) was under development in 1975 and was scheduled for completion in 1976. The underground mine No. 9–10 (annual capacity, 1 million tons of crude ore) was also under development at this complex. Three new mines, each with an annual capacity of 200,000 tons of crude ore (including the second stage of Ikhtvisi-Novyy and Ikhtvisi-West), were put into operation in the Chiatura manganese basin in 1975. Development of four new mines began in 1975. They are to be put into operation during the tenth 5-year plan period (1976–80).

A manganese deposit was found in western Georgia. The reserves are enough for five separate mines. Reportedly, Union Carbide and the U.S.S.R. are discussing

[84] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Dec. 28, 1975, p. 2.
[85] Page 5 of work cited in footnote 56.
[86] Sotsialisticheskaya industriya (Socialist Industry), Moscow. July 9, 1975, p. 2.
[87] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 44, 1974, p. 2.
[88] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Jan. 6, 1976, p. 2.
[89] Material'no-tekhnicheskoye snabzheniye (Material-Technical Supply), Moscow. No. 7, July 1975, p. 24.

Union Carbide's cooperation in the design and construction of a ferromanganese plant in Nikopol in the Ukraine.

Mercury.—Output of mercury was estimated at 55,000 76-pound flasks, and the U.S.S.R. was apparently self-sufficient in mercury in 1975. Exports of mercury to Western countries started in 1975. The Khadarkan complex in Kirgizia, the largest Soviet mercury operation, had four mines and a recovery plant in operation in 1975. At the Khadarkan complex, mercury is mined by both underground and open pit methods. After attaining full capacity at the Ulug-Too mine at this complex, output of mercury is to be increased 10%. It is planned to renovate the metallurgical facilities of the Khadarkan complex and to develop a new mine in the 1976–80 period. This complex fulfilled the 1971–75 5-year production quota.

The Nikitovskiy combine in the Ukraine, where 95% of ore is mined by underground methods, was the second largest producer of mercury. Construction continued on the Dzhidzhikrutskiy mercury-antimony complex in Tadzhikistan, rescheduled for completion in 1976–80. In 1975, mercury output in Magadan Oblast' was about 30% higher than in 1970.

Molybdenum.—Output of molybdenum concentrate (metal content) was estimated at 9,060 tons, 3% above that of 1974. Reserves of molybdenum in ore (molybdenite, copper-molybdenum, and tungsten-molybdenum ores) in the U.S.S.R. may approach 200,000 tons. About 50% of production is based on copper-molybdenum ores from Armenia, Kazakhstan, Sorskoye, and others in Siberia; over 30% is from the tungsten-molybdenum ores of Tyrny-Auz (Kabardin A.S.S.R. in the North Caucasus) and Dzhida (Buryat A.S.S.R.); the remainder comes from molybdenite ore mined in Uzbekistan and at Umaltinsk and Chikaysk in Siberia.

Armenia was the largest producer of molybdenum concentrate from copper-molybdenum ores, but the concentrate was shipped out of the Republic for further treatment. The Kadzharan copper-molybdenum complex in this Republic supplied over 20% of Soviet molybdenum in 1975. The Sorskiy molybdenum combine in Krasnoyarsk Kray was the largest molybdenum producer in the country in 1975. The complex reportedly had produced low-quality products, but the recovery of molybdenum in concentrate increased at the Sorskiy complex from 85.61% in 1972 to 88.76% in 1974. The Balkhash metallurgical complex in Kazakhstan and the Almalyk complex in Uzbekistan increased the output of molybdenum concentrate during the year. The Tyrny-Auz tungsten-molybdenum complex, where 350 workers were employed, was being enlarged in 1975.

Nickel.—With an estimated 152,000 tons of smelter production, 4.8% more than in 1974, Soviet nickel output was second only to that of Canada. Sulfide ores are mined at Norilsk in West Siberia and in the Pechenga-Monchegorsk area on the Kola Peninsula. Oxide ores are produced in the Aktyubinsk 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, the Urals, and the Kola Peninsula. Of the seven smelters in operation, Norilsk is the most important; the Ufaley, Rezh, and Khalilovo smelters in the Urals follow. Then come the Monchegorsk and Pechenga smelters, followed by the Pobuzhsk ferronickel plant in the Ukraine. Production is estimated at a probable 160,000 tons in 1976 and 190,000 tons in 1980.

The experience of the Norilsk complex and other northern enterprises has demonstrated the advantages and the high degree of effectiveness of imported equipment designed for use in severe winter climates. However, the Norilsk complex does not have much of this equipment. Thus, of the presently operated excavators having a bucket size of 4.6 to 8 cubic meters, only 14% are specially designed for use in severe winter climates. Of the considerable number of excavators with a bucket size of up to 4 cubic meters, only a small percentage are specially designed for severe conditions. However, other hoisting and transporting equipment operated in the open air under conditions of the long Arctic winter is manufactured with proper consideration for the region's severe climate.[90]

One open pit (Medvezhiy Ruchey) and one underground mine (Zapolyarnyy) were in operation at the Norilsk-1 sulfide

[90] Page 46 of work cited in footnote 72.

deposit, where the ore averages 0.75% copper, 0.5% nickel, and up to 11 grams per ton platinum-group metals—mainly palladium and platinum. Two underground mines (Mayak and Komsomol'skiy) operate at the Talnakh deposit, where ores average about 3% copper, 1.5% nickel, and up to 11 grams per ton platinum-group metals. Two stages of the Oktyabr'skiy underground mine were in operation at the Oktyabr' deposit. The third stage of this mine was put into operation in December 1975. Full planned capacity is to be reached in four stages by 1980. The Oktyabr'sk mine is the largest underground mine in the Soviet nonferrous industry; ores average 3.65% nickel, 4.7% copper, and 0.13% cobalt and are associated with platinum-group metals. Prospecting is being carried out north of Norilsk.

Development of the Taymyr underground mine (Glubokiy), which began in 1972, continued in 1975. The ore will be mined at a depth of 1,500 meters from 6 vertical shafts. The project is planned for completion in 9 years. The ore output at Norilsk, Talnakh, and Oktyabr'sk deposits in 1975 was planned to be 60% greater than in 1970. Construction of the 1-billion-ruble Nadezhda copper-nickel plant at Norilsk, a major project of the tenth 5-year plan (1976–80), continued with the participation of Finnish companies; the first stage, scheduled for completion in 1974, has been rescheduled for 1977. Autoclaves are to be used there for the first time in the Soviet Union's nonferrous metallurgical industry. An additional agreement between the Soviet trade agency Tekhmashimport and a group of Finnish companies has been signed in Moscow on supplies of Finnish machinery and equipment for the Norilsk complex. The value of this further agreement is about 300 million markkas bringing the total value of Finnish deliveries to over 1,500 million markkas.

The Monchegorsk ore averages about 0.7% nickel, 0.4% copper, and some cobalt and precious metals. Ore at the Lovnozersk deposit averages 0.9% nickel, 0.5% copper, 0.04% cobalt, and some precious metals. The ores at the Severonikel complex are mined by both opencast and underground methods, and the Zdhanovskiy mining and ore-dressing complex is the largest of the operations in this area. Three underground mines (Kaula, Kotselvaara, and Kammikivi) and two open pits (Kaula and Kammikivi) were in operation at the Pechenganikel complex. The Northern mine of the Pechenganikel complex was put into operation in December 1975. The ore of this deposit is rich in nickel. The planned production cost of nickel in concentrate at Pechenganikel was 1,953 rubles per ton in 1975.

The port of Murmansk continued handling Norilsk ore for the Severonikel complex. During the 7 to 8 months of the navigation season, some 200,000 tons were shipped; this figure is to be increased in the future. Development of the Shcherbakov oxide-ore open pit at the Kimpersay region in the Aktyubinsk area of the south Urals in Kazakhstan began in 1975.

A cooperation agreement between Cuba, the U.S.S.R., and other COMECON countries provided for the construction of a nickel plant at Punta Gorda in Cuba with an annual capacity of about 30,000 tons of nickel and cobalt. The plant is to go into operation after 1980. The participating countries are delivering basic materials, equipment, and machinery to Cuba, and are also offering services and technical assistance. One-half of the output of the new project will go to the COMECON countries participating in the joint venture for a 10-year period following commissioning. The project will cost approximately $300 million. Also under the agreement, the Nicaro and Moa nickel plants are to be modernized by the Soviet Union.

Platinum-group Metals.—The U.S.S.R. remains the largest producer and exporter of platinum-group metals, supplying 20% of international exports of platinum and more than 50% of world consumption of palladium and rhodium. The Soviet Union is steadily expanding its output of platinum-group metals, with 1975 output estimated at 2.65 million troy ounces, more than 20% higher than in 1970. Production comes principally from Norilsk mines, with additional output from the Severonikel and Pechenganikel complexes on the Kola Peninsula. All the platinum-group metals are produced as byproducts of copper-nickel ores. Primary production of platinum-group metals is forecast to increase at an annual rate of 4% to 5% and may reach 2.75 million troy ounces by 1976 and 3.2 million troy ounces by 1980.

The U.S.S.R.'s substantial exports of gold and platinum-group metals in 1975 were assumed to be the result of the urgent need for foreign exchange to meet the cost of its large grain purchases from the United States and other Western countries. Reportedly, the Soviet Union was a heavier seller of platinum-group metals in 1975, thus reducing the need to sell gold. The United States and Japan were the major importers of Soviet platinum-group metals. The volume of further Soviet platinum-group metal sales depends largely on gold and platinum-group metal prices and on long-term credits made available by Western countries.

In the U.S.S.R. the following purity standards are established for items of general use, in parts per thousand: Platinum 950 and palladium 850 and 500.

Silver.—Output of silver in 1975 was estimated at 43 million troy ounces, 2.4% above that of 1974. Over 50% was produced as a byproduct of lead, zinc, and copper ores. Fourteen gold treatment plants also produced silver in 1975. Production continued to be centered in the Urals, Kazakhstan, the Soviet Far East, East Siberia, and Armenia. In 1975, production of silver increased at the Sikhali complex (one of the largest silver producers) in Maritime Kray, but output of metal at this complex was below the planned quota.[91] The recovery of silver at beneficiation plants in the Urals ranged from 15% to 50% from complex ores containing 6 to 15 grams of silver per ton. During the 1972–74 period recovery of silver at the Gay complex in the Urals increased 5.6%.

Soviet purity standards for silver are established as follows, in parts per thousand: 960, 916, 875, 800, and 750. Under the guidance of the Administration of Precious Metals of the U.S.S.R. Ministry of Finance, the inspectorate of the assay office is charged with the continuing responsibility of searching for ways to economize on precious metals by reducing waste and increasing substitution.

Tin.—Production of smelter tin, amounting to an estimated 30,000 tons (1.7% over that of 1974), was inadequate to meet domestic demand, and over 15% of requirements were imported in 1975. Deposits of commercial significance are found in Maritime Kray, Magadan Oblast', Khabarovsk Kray, and Yakut A.S.S.R. Maritime Kray is the largest producer and the Khrustal'nyy complex, which operates both lode and placer deposits, is the largest enterprise there. The following important lode deposits were mined in Siberia and the Soviet Far East in 1975: Valkumey, Lazo, Verkhniy Bastoy, Chapayev, Ege-Khaya, Okhotnichye and Iultin.

Three known tin refineries were operating in the U.S.S.R. in 1975: Novosibirsk, Ryazan', and Podol'sk (near Moscow). The Novosibirsk central smelter's 5-year plan (1971–75) envisaged a large increase in tin output. Concentrates from Siberia and the Soviet Far East were shipped to this plant. It was planned to increase output of metal at the Sherlova Gora, Ege-Khaya, Leningrad, Sinancha, and other smelters. Because of the slow development of the Ternistyy and Arsenyev mines, production of tin at the Krustal'nyy complex increased only 8% in 1971–75, compared with 26% envisaged in the plan.[92] Production of secondary tin began at the Ukrtsink zinc plant in the Ukraine.

According to Soviet sources, the first experimental installation in the U.S.S.R. for recovering tin offshore has been built and is operating at Vankin Bay in the Laptev Sea in Yakut A.S.S.R. A survey of the Festival'nyy tin deposit in Khabarovsk Kray was completed in 1975. The deposit, which also contains copper and tungsten, was given to the Solnechnyy mining and concentration complex for commercial operation.

Under a contract signed in La Paz, the Mining Corp. of Bolivia supplied the U.S.S.R. with 900 tons of tin concentrates. Shipments, in exchange for Soviet machinery and equipment, were made over the 1975 yearend period. Reportedly, the contract is to be expanded by 1,500 tons of tin concentrates.

In 1975, the Nakhodka tin can plant in Maritime Kray received from Fried. Krupp GmbH equipment for a new automatic production line to make oval tinplate cans. The line will turn out 100 cans per minute.

Titanium.—Titanium production in 1975 was estimated at 30,000 tons, about

[91] Work cited in footnote 86.
[92] Work cited in footnote 86.

8% over that of 1974. Large amounts of titanium sponge are now sold to the West. The industry continued to be based mainly on Ukrainian and Siberian ilmenite and rutile. During 1971–75, a 40% planned expansion was almost met. The new 5-year plan for the titanium-magnesium industry will be devoted to renovation of equipment at existing plants. Production of titanium is programed to be raised 40% in 1976–80. Exports of titanium sponge are to be increased significantly. Estimated output for 1976 and 1980 is 32,500 tons and 42,500 tons, respectively.

At the Verkhne-Dneprovsk mining and concentrating complex in the Ukraine, in addition to ilmenite and rutile concentrates, zirconium, disthene, and staurolite concentrates were recovered. But recovery of titanium and other components was not satisfactory.[93] Reports had indicated that a titaniferous slag containing 83% titanium dioxide was being made at the Zaporozhe titanium-magnesium plant in the Ukraine. During 1971–75, production of titanium and magnesium at the Ust'-Kamenogrosk plant in Kazakhstan increased over 32%. It is planned to increase production of titanium in Kazakhstan 5% in 1976 and 28% in 1980, compared with that of 1970.

In 1975, consumption of titanium in the Soviet economy was increasing rapidly and was exceeding production. The consumption of titanium during the past 10 years has increased more than 20 times in nonferrous metallurgy, in the chemical industry, and in chemical and petrochemical plant manufacture. The amount of titanium waste that has accumulated at metal-processing centers is significant, and Soviet plans are to create a secondary titanium industry in the near future.

The Soviet Union sponsored an active program of exhibitions and symposia on titanium as a means to attract new technology, equipment, and cooperative agreements. At the first International Symposium on Titanium, held in Moscow in November 1975, Soviet specialists initiated an exchange of technical-scientific information on production and use of titanium and its alloys.

Tungsten.—Production of tungsten in concentrate was estimated at 7,800 tons, 2.6% more than that of 1974, with the North Caucasus, Transbaykal, Soviet Far East, Central Asia and Kazakhstan remaining the principal producing centers. Production of tungsten has been insufficient to satisfy growing domestic needs, and about one-third of concentrate requirements has been imported from the People's Republic of China and other countries. Production is estimated at a probable 8,000 tons in 1976 and 8,700 tons in 1980. Consumption of tungsten by the Soviet steel industry is much higher than that of the ceramic hard alloys industry.

The main producer of tungsten concentrate is the Tyrny-Auz tungsten-molybdenum complex in the North Caucasus, where both underground and open pit methods are used; over 350 persons were employed at the concentrator in 1975. The concentrating plant at the Iultin complex in Magadan Oblast' began processing tungsten ore mined at the Tenke deposit in October 1975. The Inkur open pit and the first section of the Dzhida tungsten-molybdenum complex in Buryat A.S.S.R., which were put into operation in 1973, increased output in 1975. The Ukak (Tadzhik S.S.R.), Boguty, and Karooba tungsten deposits were under exploration in 1975.

Vanadium.—The Soviet Union, with large vanadium resources, is becoming an important producer and exporter. The principal sources of vanadium continue to be slag from smelting titaniferous magnetite from the Kachkanar mine in the Urals and iron ore from Lisakovsk (0.06% vanadium) in Kazakhstan. The Nizhniy Tagil metallurgical complex is the only modern enterprise in the U.S.S.R. that produces raw material for the production of vanadium and its alloys. The output of vanadium slag was low.[94] It is planned to develop the Kachkanr 2 and by 1980 to increase production of vanadium. It is also expected to put a vanadium recovery unit at the Serov plant in the Urals. The Ust'-Kamenogrosk titanium-magnesium complex in Kazakhstan has commissioned a unit for vanadium recovery from wastes. The Dneprovsk aluminum plant recovers

[93] Ekonomika Sovetskoy Ukrainy (Economics of the Soviet Ukraine), Kiev. No. 5, May 1975, p. 44.
Pages 5 and 6 of work cited in footnote 34.
[94] Second work cited in footnote 70.

vanadium pentoxide as a byproduct during the production of alumina from bauxite.

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, the Kola Peninsula, Armenia, the Urals, the Ukraine, Norilsk, Transbaykal, and the Soviet Far East.

Byproduct gallium is recovered from nepheline raw materials used to produce aluminum at the Volkhov and Pavlodar aluminum plants and at the Tikhvin alumina plant. The first industrial recovery of rhenium in the U.S.S.R. was at the Balkhash copper complex in June 1966 where rhenium salts are recovered from sulfuric acid plant washings. Rhenium is also recovered at the Kadzharan copper-molybdenum complex in Armenia, at the experimental installation of the Dzhezkazgan complex in Kazakhstan, and at other nonferrous plants. In 1975, recovery of rhenium began at the Chimkent lead plant in Kazakhstan.

Selenium and tellurium extraction has been organized at the electrolytic copper plant of the Norilsk complex in West Siberia. Selenium is also recovered at the nonferrous enterprises of Kazakhstan, the Urals, and the Kola Peninsula. Commercial production of indium began at the Almalyk complex in Uzbekistan in 1975. The Ust'-Kamenogrosk titanium-magnesium complex in Kazakhstan began recovery of scandium in 1975.

The bulk of tantalum and columbium reserves in the U.S.S.R. is in pyrochlore (Kola Peninsula, Urals), obruchevite (Kola Peninsula, Ukraine), and hetchettolite (Kola Peninsula, Khiba, and others). Reportedly, a rare metals deposit was discovered at Urminsk in the central part of Buryat A.S.S.R. in 1975.

NONMETALS

The Soviet Union produces a wide variety of nonmetallic minerals. However, the resource position varies from adequacy for many nometallic minerals to apparent shortages of others such as barite, fluorspar, mica, and talc.

Asbestos.—In 1975, total production of the six grades of asbestos produced by the Soviet Union was estimated at 1.9 million tons, 835,000 tons more than in 1970 but 300,000 tons less than that planned for the year.[95] Exports rose from 385,300 tons in 1970 to 528,000 tons in 1974 and to 613,000 tons in 1975, with about 60% going to Western markets. The price of asbestos rose from 118 rubles per ton in 1973 to 126 rubles per ton in 1974 and to an estimated 130 rubles per ton in 1975. Concurrent with the asbestos export expansion in recent years, the domestic deficit reached 200,000 tons in 1971; it was expected to be 100,000 tons in 1975.[96] The 1971–75 5-year plan foresaw an increase in new capacity by completion of the second mill at the Dzhetygara complex (400,000-ton capacity) in Kazakhstan and at the Tuvaasbest complex (205,000-ton capacity) in Tuva A.S.S.R. by 1975. Estimated outputs for 1976 and 1980 are 2 million tons and 2.6 million tons, respectively.

Development in the asbestos industry has been concentrated in the Urals, Kazakhstan, and Tuva A.S.S.R. Total output of six grades of chrysotile asbestos at the Uralasbest complex was estimated at 1,250,000 tons. The No. 6 mill at this complex, with an annual capacity of 12 million tons of low-grade crude ore (1.7%) and 320,000 tons of asbestos concentrate, began operation in August 1969. During the 1971–75 period, reconstruction of the No. 6 mill had been completed and its design capacity increased by 230,000 tons. Estimated output at the No. 6 mill increased from 155,000 tons in 1970 to 550,000 tons in 1975. Estimated production of all other mills at the Uralasbest complex increased from 650,000 tons in 1970 to 700,000 tons in 1975.

In Kazakhstan, a large complex has been organized for developing the Dzhetygara deposit in Kustanay Oblast', which is the second largest in the Soviet Union. This complex, which was a 7-year (1959–65) priority construction project, started operation in 1965. The first mill of this complex, with an annual capacity of 200,000 tons, was commissioned in October 1965. In April 1965, construction started on the No. 2 mill with an annual

[95] Stroitel'nye materialy (Construction Materials), Moscow. No. 1, January 1975, p. 3.
[96] Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 12, December 1971, p. 89.

capacity of 400,000 tons, and it was to be commissioned by 1970. During 1971–75 the Dzhetygara No. 1 mill was renovated and production increased from 259,000 tons in 1970 to an estimated 360,000 tons in 1975. The first and second stages of the Dzhetygara No. 2 mill were commissioned in February 1975, and this mill produced an estimated 255,000 tons in 1975. Total output of the Dzhetygara complex increased from 259,000 tons in 1970 to an estimated 615,000 tons in 1975. Over 6,000 workers were employed at the Dzhetygara complex in 1975.[97]

The first mill of the Tuvaasbest complex at Aktovrak in Tuva A.S.S.R., with an annual estimated capacity of 30,000 tons, construction of which started in 1959, was put into operation in 1966. Construction of the second mill, with capacity of 200,000 tons per year, began in 1967 and was scheduled to be completed in 1970; completion of this mill was rescheduled at first for 1975 and later for 1976. Estimated production of asbestos at Tuvaasbest increased from 30,000 tons in 1970 to 35,000 tons in 1975. Asbestos from this deposit is of the highest quality and has the greatest fiber length of any known Soviet reserves.

Development of the Kiembay deposit in Orenburg Oblast' (southern Urals) was started in 1968 and continued in 1975; more than 2,600 workers were employed on the site. Under an agreement signed in June 1973, seven COMECON member countries are participating in this project. Machinery and materials are supplied by the individual countries and are worth the following amounts in transferable rubles: Poland, 30 million; Bulgaria and East Germany, 24 million each; Romania, 18 million; Czechoslovakia, 8.4 million; and Hungary, 1.8 million. The design capacity 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. The first is to be completed in 1979, and its output will be shared among the COMECON members in proportion to their construction contribution. The design of the Molodezhyy asbestos complex in Buryat A.S.S.R. was completed in 1974, and construction will be started when the western section of the BAM railway is built.

Barite.—Estimated domestic production of barite in 1975 totaled 350,000 tons, or 6% over that of 1974. About 40% of the country's barite consumption in 1975 was imported, mainly from North Korea, Bulgaria, Yugoslavia, and Romania. The main centers of barite output continued to be Georgia, West Siberia, and Kazakhstan. Small deposits have been developed in the Urals, Azerbaydzhan, Armenia, and other regions. Over 30% of Soviet barite reserves are located in Georgia, which produced over two-thirds of the 1975 output. Construction of a 45,000-ton-per-year complex at Khaishi in Svanetia, Georgia, and development of the underground mine at the Zharemsk polymetallic complex in Kazakhstan continued in 1975. The increased output in 1975 was attributed largely to the completion of new facilities in Georgia and Kazakhstan.

Diamond.—Soviet diamond mining continued to expand in 1975, with output mainly centered in Yakut A.S.S.R. Production was estimated, very roughly, at 7.75 million carats of industrial diamond and 1.95 million carats of gem stones. Next to fossil fuel and precious metal exports, diamond accounts for the largest share of the Soviet Union's overall foreign currency balance. Production of diamond is estimated at a probable 9.8 million carats in 1976 and 10.6 million carats in 1980.

Production in Yakut A.S.S.R. started at a small plant in 1957. In January 1975, 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 in Perm Oblast', the western Urals, where four dredges and two separation plants were operated at two placer deposits in 1975.

Gem stones were being cut at Leningrad, Sverdlovsk, and Smolensk. Sales of cut stones were rising steadily, and substantial increases are expected in 1976–80. The U.S.S.R. arranged to market part of its diamond output in Antwerp through a newly formed Soviet-Belgian company.

[97] Kazakhstanskaya pravda, Alma-Ata. Aug. 8, 1975, p. 2.

The U.S.S.R. State Committee for Science and Technology signed an agreement with a Belgian company on scientific and technical cooperation in the production and use of diamond tools.

A substantial but unknown quantity of synthetic diamond was also produced in 1975 at plants in Kiev, Yerevan, Moscow, Tashkent, and Poltava.

Fertilizer Materials.—Production totaled 22.0 million tons in nutrient content, or 90 million tons in bulk fertilizer content,[98] an increase of 15% over that of 1974. Mineral fertilizer production was expedited during the ninth 5-year plan (1971–75). The average nutrient content increased from 29% in 1970 to 37% in 1975. Estimated production for 1976 and 1980 is 94.5 million tons (Soviet standard) and 140 million tons, respectively. Nitrogen fertilizers constitute around 37%; potassium fertilizers, 35%; phosphate fertilizers, 21%; and phosphatic flour, 7%.

The increase in production was obtained mainly through the commissioning of new capacities. In 1975, capacity was expanded by 11.7 million tons of fertilizers per year, including facilities at the Rovny, Novomoskovsk, Suma, Ionav, and Balakovsk chemical plants. The planned quota for construction of new facilities (13.7 million tons) was met by 85% in 1975.

The Soviet mineral fertilizers industry met its production goal for 1975, but 10 of the 23 plants operated by the Ministry of Chemical Industry U.S.S.R. did not meet the 1975 production quota.[99] A number of mineral fertilizers plants failed to attain their production capacity in 1975. A published review of the basic reasons for the prolonged period necessary for attaining planned capacities listed the following: Inadequacy in planning; turning over facilities for operation while substantial construction and installation work remains incomplete; equipment defects; inadequacies in raw materials supply; and failure to secure qualified personnel.[1] Because of the unsatisfactory conditions of the equipment at the Uvarovo double superphosphate and ammophos shops, the degree of capacity utilization at this plant was only 34.1% in 1974.

There was an increase in exports of mineral fertilizers. Despite substantial production, the large exports and a high national demand caused a shortfall in supplies of fertilizers. A high percentage of superphosphate and potassium fertilizers was not granulated. Difficulties were reported in the commissioning of some new projects and in attaining planned capacity of facilities.

Two plants, each with a capacity of 450,000 tons per year of ammonia, were commissioned at Novomoskovsk in Tula Oblast' in 1975. The plants are part of a Soviet and Toyo Engineering Co., Ltd., contract.

Under contracts signed in Moscow in July 1975, Mitsui & Co., Ltd., and Toyo Engineering will supply the U.S.S.R. in 1976–77 with equipment for four 1,360-ton-per-day ammonia plants with a total annual output of 1.8 million tons. For this purpose the Export-Import Bank of Japan has granted U.S.S.R. Foreign Trade Bank a credit of $245 million. The plants will be located at Cherkassy, at Dneprodzerzhinsk, at Drogobuzh near Smolensk, and in Leningrad Oblast'. Mitsui has already supplied the U.S.S.R. with five ammona plants, each with a capacity of 1,360 tons per day and using the Kellog process. They are located at Novomoskovsk, Nevinomysk, Novogorod, and Severodonetsk (two plants).

Four 1,360-ton-per-year ammonia plants, with a total annual capacity of 1.8 million tons, are being built by the United States Chemical Construction Co. (Chemico) under a $200 million contract, using Chemico technology, in the Togliatti-Kuybyshev area. Completion is scheduled for 1978. A contract for another four ammonia plants with similar capacities was awarded to Creusot-Loire. These plants are based on Kellog technology, and two plants will be built at Kemerovo and two at Gorlovka. The cost, about $200 million, will be met by supplies to France of up to 300,000 tons of the plants' output annually, beginning in 1978.

It is estimated that total Soviet ammonia capacity in January 1975 was over 12 million tons with 60% to 70% capacity

[98]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 18.7% P_2O_5, potash is expressed as 41.6% K_2O, and ground rock phosphate (phosphatic flour) is expressed as 19% P_2O_5.

[99] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Jan. 15, 1976, p. 3.

[1] Khimicheskaya promyshlennost' (Chemical Industry), Moscow. No. 10; October 1975, pp. 71–74.

used. By 1980, ammonia capacity is to be increased to 20 million tons per year. There were quite a few mineral fertilizer enterprises in the U.S.S.R. that were operating stably and fulfilled the planned quota in quantity and quality of products.

An agreement between the Soviet Union and four COMECON nations has been signed for the construction of the Kingisepp mineral fertilizer plant in Leningrad Oblast'. Bulgaria, Czechoslovakia, Hungary, and East Germany will supply the equipment and materials for this plant in exchange for Soviet deliveries of ammonium phosphate over 10 years, beginning in 1976. The ore contains only 6% to 7% P_2O_5, but is easily beneficiated.

Phosphate.—Estimated output of phosphate rock totaled 61 million tons in 1975, including 35.6 million tons of apatite ore (17.7% P_2O_5) and 25.4 million tons of sedimentary rock (13% P_2O_5). The main centers continued to be the Apatit complex on the Kola Peninsula and phosphorite deposits at Karatau in Kazakhstan, Kingisepp in Leningrad Oblast', Egoryevsk and Lopatino in Moscow Oblast', and Upper Kama in the Urals.

The apatite-nepheline deposits of Khibiny on the Kola Peninsula provided about 75% of all raw materials for the production of phosphate fertilizers. Mined ore averaging 16% to 21% is upgraded to 39.4% P_2O_5 with 92% recovery. The Apatit complex produced an estimated 15.3 million tons of concentrate (35.6 million tons of ore) in 1975 from four mines and two concentrators. Production of concentrate at this complex is to be raised to 18 million tons per year by 1980. The Apatit complex employed 20,000 workers in 1975. In December 1975, commercial operations began at level 252 of the Kirov underground mine. This is the first mine in the country where ore is crushed underground and transported by conveyor. Its production capacity is 1.2 million tons per year of ore. A new technological section was put into operation at the concentrating plant in July 1975. The Apatit complex fulfilled its 1971–75 quota; it produced more than 63 million tons of apatite concentrate during the period.

A new apatite deposit at Mount Koashva was assigned to the Apatit complex in 1973. This deposit has reserves of 500 million tons of apatite ore and will play an important role in the future development of the Apatit complex. The first stage of the mine is to be put into operation in 1978 and will be linked to Kirovsk by railroad. Construction of the experimental mill at the Zabaykal'sk complex in Buryat A.S.S.R. continued in 1975. Between 1976 and 1980 this mill is to 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'sk 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 complex on the Kola Peninsula, an apatite concentrate plant with a first stage capacity of 880,000 tons was commissioned in 1975. It processes tailings from the iron complex.

A group of Soviet specialists visited the United States to examine equipment which is to be supplied to the Apatit complex. The Tsentral'nyy open pit at this complex was being provided with 400-ton U.S. bulldozers and 120-ton dump trucks, which were due to arrive at Kirovsk at the end of 1975. Excavators of up to 8 cubic meters and dump trucks of up to 40 tons capacity were in use at the Apatit complex in 1975.

The 40 commercial deposits in the Karatau area of Kazakhstan contain 1,700 million tons of phosphorite and constitute 25% of Soviet phosphate reserves. The five largest deposits, the Dzhantas, Aksay, Chulaktau, Koksu, and Kokdzhone, contain about 1 billion tons. Seven open pits at the Aksay and Dzhantas deposits and the Molodezhnyy underground mine at the Chulaktau deposit produced a total of over 10 million tons in 1975. About 70% of total production in Karatau came from the Dzhantas deposit. The ore, containing up to 25% P_2O_5 and a high content of MgO and CO_2 was upgraded to 28.5% P_2O_5, but recovery was low. It is planned to produce about 11 million tons of phosphorite in the Karatau area in 1976. New mining facilities, with an annual capacity of 1.8 million tons of ore, were under development in Karatau in 1975 and are scheduled for completion in 1976. The second stage of the Chimkent plant was also under construction. The Karatau deposits have now proven to be of lower quality than first thought, and the

Dzhambul, Kokand, Chimkent, Samarkand, Almalyk, and Kuybyshev plants were having to downgrade their standard requirements for phosphate rock to process into fertilizers. Detailed exploration of the Chiliysk phosphate deposit in Aktuybinsk Oblast' of Kazakhstan was completed in 1975. The second stage for the production of monoammonium phosphate at the Kingisepp phosphorite complex in Leningrad Oblast' was under construction in 1975 and rescheduled for completion in 1976.

The Soviet Union has agreed to develop phosphate deposits in Morocco in exchange for Moroccan phosphate.

Potassium.—The U.S.S.R. is one of the largest potash producing and consuming countries in the world. Estimated 1975 output was 18.7 million tons (41.6% K_2O), about 12% higher than in 1974. Under the 1971–75 plan, output of potash was to increase from 9.8 million tons (41.6% K_2O) in 1970 to 19.8 million tons in 1975. Estimated levels of potash output for 1976 and 1980 are 20 million tons and 25 million tons, respectively.

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. Reserves are principally carnallite and sylvite with a 13% to 20% K_2O equivalent. The second largest reserve region (4,600 million tons) is Starobinsk (Soligorsk) in Belorussia which contains sylvite (16% to 20% K_2O). The third important basin, L'vov Oblast' (2,900 million tons) is in the West Ukraine. The most important potash mineral is hartsaltz (16% K_2O), with some deposits of carnallite, polyhalite, and langbeinite. The reserves of potassium ores in the Karlyuksk deposit in Turkmen S.S.R. were reported in 1975 at 2 billion tons, and those of the Tuva-Gatansk deposit were reported at 400 million tons. The Petryakovsk deposit in Belorussia was under exploration in 1975.

There are four potash-producing centers: Solikamsk and Berezniki on the western side of the central Urals, Soligorsk in Belorussia, and Stebnikov and Kalush in the West Ukraine. The following 10 complexes were in operation in 1975: Berezniki Nos. 1, 2 and 3, Solikamsk Nos. 1 and 2, Soligorsk Nos. 1, 2 and 3, and the first stages of the Novostebnikov and Kalush complexes. The second stage, with an annual capacity of 2.5 million tons of ore, was commissioned at the Solikamsk mine, which is the fifth mine of the Uralkaliy concern. The first stage of the Soligorsk No. 4 complex in Belorussia was under construction. In 1975, construction was begun at the Berezniki No. 4 and Novo-Solikamsk complexes, each having a capacity of 7 million tons per year of potassium chloride. Planning a mine which is to provide 50,000 tons of potassium salts per year from the Khodzhaikan deposit in Uzbekistan began in 1975.

Belorussia produced over 40% of the total Soviet output of potassium fertilizers in 1975. It is planned to produce 31.7 million tons of ore in 1980. In 1975, there were three potassium complexes in operation in Belorussia, and a fourth was being built. New facilities for mining 100,000 tons per year were developed at the No. 2 mine in 1975.

Fluorspar.—Despite the Soviet Union's efforts to achieve self-sufficiency, it remained a net importer of fluorspar with imports from Mongolia, China, Japan, and Thailand. Imports increased from 144,700 tons in 1970 to 487,400 tons in 1974 and to 493,900 tons in 1975. With an estimated production of 475,000 tons, 5.5% more than in 1974, Soviet consumption of fluorspar in 1975 was 975,000 tons; the iron and steel industry consumed more than three-quarters of the total. Estimated levels of fluorspar output for 1976 and 1980 are 490,000 tons and 540,000 tons, respectively.

Maritime Kray (Yaroslavsk deposit), Transbaykal (Kalaguysk, Abagatuysk, and Dar'insk), and Kazakhstan (Taskaynar) were the main production areas in 1975. The second stage (two new large mills) of a new production facility at the Yaroslavsk mining and concentrating complex in Maritime Kray, with the same capacity of 345,000 tons per year of ore as the first stage, was completed in October 1975. The complex works one of the richest and largest deposits in the U.S.S.R. by opencast methods. Prospecting of the Naran fluorspar deposit in Buryat A.S.S.R. was completed in 1975; it is planned to develop this deposit as a unit of the Kharankoy fluorspar mine, which is now in operation.

The Vostochnyy Taskaynar deposit in southern Kazakhstan was under detailed exploration in 1975.

Mica.—Output, estimated at 42,000 tons, 2.5% over that of 1974, was inadequate to meet demand, and strategic-grade mica continued to be imported from India for special industrial requirements. Imports of high-grade mica rose from 483 tons in 1970 to 498 tons in 1975.

Irkutsk Oblast' continued to be the main supplier of muscovite mica; 75% of all muscovite deposits in the country are in Mamsko-Chuysk County of Irkutsk Oblast'. Over 1,500 beds have been discovered in this area, and nine underground mines were in operation in 1975. There are three groups of Mamslyuda mica, depending on the size of crystal. The first group includes crystals having a surface of 100 square centimeters or more. The second and third include, respectively, areas between 50 and 100 and between 4 and 50 square centimeters. Only 10% of the ore is in group 1, while groups 2 and 3 constitute, respectively, 14% and 76%. All small mica goes to waste. The Irkutsk mica factory is the largest in the U.S.S.R. Mica is also mined in Murmansk Oblast' on the Kola Peninsula, Karelia and Yakutia. The Malinovaya Varakka and Plotina small mines were in operation near Chupa in Karel A.S.S.R. in 1975.

Salt.—The Soviet Union is one of the world's leading countries for salt reserves, production and exports. It was planned to increase production of salt from 12.4 million tons in 1970 to 14 million tons in 1975 and to 20 million tons in 1980. However, estimated production levels for 1975 and 1980 are only 13.8 million tons and 18 million tons, respectively. Exports increased from 293,600 tons in 1970 to 320,700 tons in 1975. Salt development is concentrated in the Donets Basin, the Urals, East Siberia, Armenia, and the West Ukraine.

The Donets Basin continued to account for over 40% of the total output in 1975. Development of a new mine, with an annual capacity of 2 million tons, at Artemovsk in this region continued in 1975. The construction of the Verkhnekams salt complex in Perm Oblast' and renovation of the Iletsk mine continued in 1975. Construction of the Mosyr salt complex in Belorussia, based on rock deposits which lie at a depth of 700 meters, continued in 1975. Surveying of the Belbazh salt deposit in Gor'kiy Oblast' has been completed. Exploration of a rock salt deposit near the town of Novaya Zima in Irkutsk Oblast' and the Gusev deposit in Kaliningradskaya Oblast' was continued in 1975.

Sulfur.—Estimated domestic production of contained sulfur totaled 8.2 million tons, of which 3.7 million tons was recovered from pyrite, 2.5 million tons from native sulfur, and 2.0 million tons from other sources. Sulfur exports, mainly to COMECON countries, decreased from 463,800 tons in 1970 to 441,000 tons in 1975. Consumption of sulfur from all sources totaled 8.2 million tons. Imports of sulfur increased from 216,700 tons in 1970 to 471,800 tons in 1974 and to 690,000 tons in 1975.

In 1975, the principal producing centers for native sulfur continued to be Rozdol and Yavorov (West Ukraine); Gaurdak, Shorsu, and Changyrtash (Central Asia); and Alekseyev and Vodnin of the Kuybyshev sulfur complex (Volga group). The Rozdol chemical complex was the country's major producer of native sulfur and, with the Gaurdak complex, provided the bulk of the country's sulfur requirements. The Kuybyshev sulfur complex accounted for less than 10% of the Soviet output of native sulfur in 1975.

The Gaurdak complex has been in operation for more than 40 years, but it has been modernized over the past 10 years and production has expanded from 40,000 tons to 360,000 tons, as may be seen from the following figures:

Gaurdak complex	1934	1940	1950	1960	1970	1974	1975 planned
Output of sulfur _____thousand tons__	2	4.2	7.7	18.9	189.6	309.6	360
Production of ore _____________do____	NA	NA	NA	138.9	535.1	1,342.8	1,222.1
Value of sulfur ____thousand rubles__	NA	NA	NA	NA	12,121	20,371	23,880

NA Not available.

Source: Gornyy zhurnal (Mining Journal), Moscow. No. 2, February 1975, p. 15.

Sulfur production by the Frasch process at the Gaurdak complex has increased rapidly since the second commercial installation went into service at the end of the first quarter of 1975. Construction of a new (No. 3) installation using the Frasch process, to produce 100,000 tons per year of sulfur, is to be started under the tenth 5-year plan, and by 1980 production is planned at 300,000 tons. In January, the first stage of an open pit was commissioned at the Yavorov mining and chemical complex in L'vov Oblast'. The ore is to be sent to the Rozdol mining and chemical complex for sulfur recovery.

Sulfuric acid production began at the Gorlovka chemical complex in the Ukraine, at the Sumgait superphosphate plant in Azerbaydzhan, and at the second section for production of sulfuric acid at the Dzhezkazgan copper complex in Kazakhstan. A plant to recover sulfur from sour gas has been built at Orenburg. J.E. Pritchard and Co. and a French affiliate, Cie. Centrale d'Études Industrielles, provided equipment and management services for the $76 million plant, which produced 270,000 tons of sulfur in 1974 and 360,000 tons in 1975. A new Polish-Soviet transaction has been concluded in Moscow, providing for the delivery by Poland in 1978 of three new sulfuric acid plants with a capacity of 1,515 tons per day each. In previous years, the Soviet Union has purchased 25 sulfuric acid plants from Poland.

MINERAL FUELS

Production of primary energy derived from fossil fuels, fuelwood, and hydroelectric and nuclear generation increased from 699.1 million tons in standard fuel (coal) equivalent in 1960 to 1,237.5 million tons in 1970 and to an estimated 1,610.2 million tons in 1975. The output of primary energy (from all sources) in 1976 is placed at 1,725 million tons of standard fuel, and by 1980 is to rise to over 2,000 million tons. Compared with 1975 output, the 1980 production of oil is to increase 30%, natural gas 51%, coal 15%, hydroelectric power 47.9%, and nuclear power 233%.

The share of petroleum and natural gas in total Soviet primary energy production increased from 38.0% in 1960 to 65.0% in 1975, while that of coal (anthracite, bituminous, and lignite) declined from 53.4% to 30.6%. In 1980, the share of petroleum and natural gas in total energy production is to be about 69%, plus 27% in the form of coal and 4% for all other sources.

Total consumption of all types of primary energy in the Soviet Union increased from 646 million tons of standard fuel equivalent in 1960 to 1,085 million tons in 1970 and to an estimated 1,405 million tons in 1975. The share of petroleum and natural gas in total Soviet primary energy consumption increased from 34.6% in 1960 to 61.5% in 1975, while that of coal declined from 56.5% to 33.7%. Total consumption of all types of primary energy in the U.S.S.R. is expected to be equivalent to 1,480 million tons of standard fuel in 1976 and about 1,785 million tons in 1980. It is expected that the U.S.S.R. will make great efforts to substitute coal and natural gas for petroleum in order to make the latter available for export. The Soviet Union is expected to consume considerably less petroleum per capita in 1980 than West European countries.

In 1975, the U.S.S.R. produced 491 million tons of crude oil and gas condensate, 701 million tons of run-of-mine coal and lignite (402 million tons of comparable clean coal), and 289,000 million cubic meters of natural gas. Soviet long-range forecasting places the demand for raw coal and lignite at 805 million tons in 1980 and at 1,000 million tons by 2000.

Soviet fuel exports to COMECON countries increased from 320 million tons (standard fuel equivalent) during 1966–70 to 562 million tons in 1971–75. Planned exports to COMECON countries included 364 million tons of crude oil, 90 billion cubic meters of natural gas, and 67 billion kilowatt-hours of electric power in 1976–80.

According to published long-term agreements between the Soviet Union and other COMECON countries, agreements between COMECON nations, West European countries, and Japan, and trade objectives announced in the various COMECON countries' 5-year plans for 1976–80, it has been estimated that fuel exports from the U.S.S.R. to market economy countries would be increased from 94 million tons of standard fuel in 1975 to 125 million tons in 1980. Some 59 million tons of crude oil and petroleum products, 12 million tons of coal and coke, and about 22 billion cubic meters of gas are to be exported to market economy countries in 1980.

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 the demand 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 high-cost output and underutilization of energy.

The Soviet Union's reported energy consumption per capita approaches that of West 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 encourage the production of substandard fuels, which are often marketed as standard-quality fuels.

Total primary energy balances of the U.S.S.R. for 1960, 1965, 1970, and 1975 and estimates for 1980 are shown in table 9.

Coal.—In 1975, the Soviet Union produced 701 million tons of run-of-mine coal—bituminous coal (459 million tons), anthracite (76 million tons), and lignite (166 million tons), or an estimated equivalent of 402 million tons of clean coal, according to Western practice and experience, placing it second among the world's coal producers. The 2.4% increase from the 1974 level was achieved mainly in coking coal, of which 180 million tons was produced (3% more than in 1974). The Soviet coal industry employed 2.2 million

Table 9.—U.S.S.R.: Total primary energy balance for 1960, 1965, 1970, 1975, and estimated 1980

(Million tons of standard fuel (coal) equivalent [1])

	Total primary energy	Coal (lignite, anthracite and bituminous) and coke	Crude oil and petroleum products	Natural and associated gas	Peat	Oil shale	Fuel-wood	Hydro-electric power	Nuclear power
1960:									
Production	699.1	373.1	211.4	54.4	20.4	4.8	28.7	6.3	--
Imports	12.3	5.6	6.7	--	--	--	--	--	--
Exports	65.6	16.0	49.3	.3	--	--	--	--	--
Apparent consumption	645.8	362.7	168.8	54.1	20.4	4.8	28.7	6.3	--
1965:									
Production	976.6	412.5	346.4	149.8	17.0	7.4	33.5	10.0	(2)
Imports	10.6	7.6	3.0	--	--	--	--	--	--
Exports	123.0	27.7	94.6	.5	--	--	--	.2	--
Apparent consumption	864.2	392.4	254.8	149.3	17.0	7.4	33.5	9.8	(2)
1970:									
Production	1,237.5	432.7	502.5	233.5	17.7	8.8	26.6	15.3	0.4
Imports	18.8	7.8	6.6	4.4	--	--	--	--	--
Exports	170.9	28.7	137.5	4.1	--	--	--	.6	--
Apparent consumption	1,085.4	411.8	371.6	233.8	17.7	8.8	26.6	14.7	.4
1975:									
Production	1,610.2	492.0	702.0	345.0	14.4	11.5	26.0	16.9	2.4
Imports	36.4	10.7	10.8	14.9	--	--	--	--	--
Exports	241.3	30.3	186.5	23.1	--	--	--	1.4	--
Apparent consumption	1,405.3	472.4	526.3	336.8	14.4	11.5	26.0	15.5	2.4
1980: [e]									
Production	2,086.5	565.0	915.0	520.0	15.7	12.8	25.0	25.0	8.0
Imports	46.7	13.0	15.7	18.0	--	--	--	--	--
Exports	347.8	36.0	250.0	60.0	--	--	--	1.8	--
Apparent consumption	1,785.4	542.0	680.7	478.0	15.7	12.8	25.0	23.2	8.0

[e] Estimate.
[1] 1 ton of standard coal equivalent (SCE) = 7,000,000 kilocalories.
[2] Less than ½ unit.

men and women, including about 1.2 million "production" workers, some 0.6 million "nonproduction" workers, 213,000 graduate engineers and technicians, and 28,000 managers and general managers.[2] The coal industry employed 770,000 women, including 109,000 at underground mines.[3] There were 638,000 workers in the Donets coal basin alone in 1975.[4]

The share of surface-mined coal in the total output was 32.2%, compared with 30% in 1974 and 24.3% in 1968. The Asian part of the U.S.S.R. (east of the Urals) contributed 56% of the total production in 1975, compared with 49.5% in 1965.

Although the U.S.S.R. does not publish statistical data on injuries in the coal industry, available Soviet information discloses that "The number of accidents in the coal industry remains high . . . It is because untrained people are being sent to the longwalls." [5]

There were about 800 underground mines with an average annual capacity of some 585,000 tons and 70 open pits with an average annual output of some 3.2 million tons of run-of-mine coal and lignite. Raw coal production by principal basin in 1975 was as follows, in million tons:

Basin	Total output	Coking coal
Donets	221.5	88.5
Kuznetsk	134.0	56.2
Karaganda	46.3	18.1
Moscow	34.1	--
Pechora	24.2	14.4
Others	240.9	2.8
Total	701.0	180.0

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.

The average working thickness of the coal seams, according to 1975 data, was 1.32 meters. The maximum depth of underground coal production reached 1,150 meters in 1975, while the average depth was about 380 meters.

The relative share of coal production coming from gently dipping seams was about 70%; that from inclined seams, 14%; and that from steep seams, 16%. The hand loading of coal at gently inclined seams was over 20% in 1975.

Distribution of coal production by mining method, in percent, follows:

Longwall	85
Slicing	8
Shield	3.2
Room and pillar	1.7
Others	2.1

In 1975, the average longwall length was 135 meters, and the average rate of advance was 39.1 meters per month. The average capacity of each underground mining section (longwall) was 454 tons of raw coal per day (four 6-hour shifts) in 1975. Some salient characteristics of coal and other data of main basins are given in table 10. Soviet coal and coke statistics are presented in table 11.

Natural Gas.—In a single decade the U.S.S.R.'s natural gas industry has raised the output at more than 650 gas, gas condensate, and gas-oilfields from 128 billion cubic meters in 1965 to 289 billion cubic meters in 1975; however, this output was below the original 5-year plan target of 300 billion to 320 billion cubic meters. Of this quantity, over 99% consisted of natural gas and oil associated gases and about 1% was gas from gasification of coal and oil shale. About three-fifths was produced in the European part of the country (eastern regions of the Ukraine, the North Caucasus region, the Lower Volga region, Komi A.S.S.R., and the Orenburg region). There were about 5,000 producing wells in 1975, but 15% to 20% of them were idle. In 1975, gas accounted for over 21% of Soviet primary energy production. Although the production of natural gas increased substantially during the past decade, the industry has not been able to meet a single original annual production goal set for it since 1956.

During the past decade, the recovery of associated gases more than trebled, reaching 55 billion cubic meters in 1975. In 1975, the utilization of associated gas was about 75%. In the Tatar and Bashkir A.S.S.R.'s, Kuybyshev and Perm Oblast's, Krasnodar and Stavropol Krays, and the Azov oil association, the utilization of associated gas reached over 80%. The utiliza-

[2] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 34, August 1976, p. 13.
[3] Sovetskiy shakhter (Soviet Miner), Moscow. No. 3, March 1975, p. 1.
[4] Ugol' Ukrainy (Coal of the Ukraine). Donetsk. No. 1, January 1975, p. 3.
[5] Trud (Labor), Moscow. Aug. 5, 1975. p. 2.

Table 10.—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	Large reserves represented mainly by thin seams. Two-thirds of reserves are high-grade coals of which one-half are coking coals. More than 70% of 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 reserves. Recently 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 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 with an ash content of about 45%. Coal seams are flat. Main consumers of the coal produced in this basin are powerplant and domestic heating in the central regions of the U.S.S.R.

Table 11.—U.S.S.R.: Coal and coke statistics

(Million metric tons)

	Actual				Forecast
	1960	1965	1970	1975	1980
Coal:					
Domestic output:					
Run-of-mine coal [1]	509.6	577.7	624.1	701.0	805.0
Clean coal [2]	306.0	331.0	357.0	402.0	460.0
Imports: From countries with centrally planned economies [3]	4.7	6.7	7.1	9.8	12.0
Exports:					
Countries with centrally planned economies	8.2	15.2	14.8	16.8	19.0
Market economy countries	4.1	7.2	9.7	9.3	11.0
Total	12.3	22.4	24.5	26.1	30.0
Apparent consumption:					
Run-of-mine coal [1]	502.0	562.0	606.7	684.7	787.0
Clean coal [2]	298.4	315.3	339.6	385.7	442.0
Coke:					
Domestic output	56.2	67.5	75.4	84.4	95.0
Imports: From countries with centrally planned economies [3]	.7	.7	.7	.7	1.0
Exports:					
Countries with centrally planned economies	2.2	2.8	3.2	3.2	5.0
Market economy countries	.4	1.0	.9	1.0	1.0
Total	2.6	3.8	4.1	4.2	6.0
Apparent consumption	54.3	64.4	72.0	80.9	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 1975. Production data for 1975 reported in Pravda, Moscow, Feb. 1, 1976, p. 1.

tion of gas condensate resources was unsatisfactory at existing low-temperature separation facilities in the field; about 60% of the condensate produced with the gas was recovered, and the remaining portion was placed into gas pipelines where much of it was lost.

At yearend 1974, the Soviet gas supply system consisted of several hundred fields, 92,100 kilometers of pipelines, more than 80 compressor stations, 16 underground gas storage facilities, and about 300 commercial installations for the collection and processing of gas. The Soviet gas industry was reorganized into 46 production and commercial associations in 1975, through combining 200 independent enterprises and organizations.

The 1975 planned targets in the main gas-producing regions, in billion cubic meters, were as follows:

Ukraine (natural gas)	57.5
Turkmenia	47.5
Uzbekistan	36.2
Tyumen' Oblast'	34.5
Orenburg region	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
Other	32.2
Total	285.0

Thirty-four gasfields were in operation in the Ukraine, including Shebelinka and Efremovka. Some 60 new gas wells were put into operation in the Ukraine in 1975.

The Bukharo-Khivinskiy region (eastern Turkmenistan and western Uzbekistan) continued to occupy first place in the production of gas in the U.S.S.R. Production of gas in this region reached an estimated 83 billion cubic meters in 1975, an increase of 75% compared with that of 1971. The gross gas reserves as of January 1, 1975, were estimated at 2,761 billion cubic meters (including 1,856 billion cubic meters in eastern Turkmenistan). At the beginning of 1975, 21 gasfields were in operation (including 6 in eastern Turkmenistan) and 15 gasfields were under development (including 4 in eastern Turkmenistan).

Development of the North Achak, Naip, East Shaltyk, and West Shaltyk gasfields in eastern Turkmenistan resulted in the production of 47 billion cubic meters of natural gas in Turkmen S.S.R. in 1975, four times the amount produced in 1970. The Shaltyk gasfield was supplying 48 million to 50 million cubic meters of gas per day in 1975, compared with 40 million to 42 million cubic meters per day in 1974. It is planned to produce 57 billion cubic meters of natural gas in this Republic in 1976. Thirteen fields and new areas are to be covered by prospecting and exploratory drilling. Total exploratory drilling is to be 80,000 meters. Developmental drilling of 120,000 meters is to be done at eight fields in 1976. Uzbekistan produced an estimated 36 billion cubic meters of gas in 1975. The gasfield at Gazli, the largest in this Republic, produced from more than 200 developmental wells, over three-quarters of the Uzbekistan total.

West Siberian gas production increased from 9 billion cubic meters in 1970 to an estimated 38 billion cubic meters in 1975. The region is slated to produce 115 billion to 145 billion cubic meters in 1980, or 29% to 33% of the Soviet total. Almost two-thirds of total Soviet gross natural gas reserves are located in Tyumen' Oblast'. Four fields were in operation in this region—Punga, Igrim, Pakhomovsk, and Medvezhye. The latter is the largest of the four. The Medvezhye Field, development of which began in 1972, produced about 1.5 billion cubic meters in 1972, over 8 billion cubic meters in 1973, and 33 billion cubic meters in 1975, or about 88% of all West Siberian production. This field is expected to produce about 40 billion cubic meters in 1976 and almost 65 billion cubic meters in 1980.

Drilling of the first developmental well at the Urengoy gasfield in Tyumen' Oblast', the Soviet's biggest gasfield, was completed in June 1975. It is expected that gas production at the Urengoy Field will begin in 1978. In 1975, pipelines were being laid and installations for gas processing were being built. According to Soviet sources, capital investment per cubic meter of gas production in West Siberia is 50% to 80% higher than in the European part of the U.S.S.R.

The Orenburg gas condensate field was one of the largest projects of the ninth (1971–75) 5-year plan. It included three interlinked industrial projects: The extractive sector, the gas refinery plant, and the main pipelines. It was planned to extract 4.5 billion cubic meters of gas in 1972, 18.5 billion cubic meters in 1974, and 25 billion cubic meters in 1975. The actual production was 3.1 billion cubic meters of gas in 1972, 11.3 billion cubic meters in 1974, and 17.4 (plan) billion cubic meters in 1975. The first stage of the 15-billion-cubic-meter-annual-capacity Orenburg gas-processing plant, which processes gas condensate from this field, was put into operation in 1974. A second stage of the Orenburg gas complex, also with a 15-billion-cubic-meter annual capacity, was scheduled for service in 1976.

Drilling of developmental wells of the third stage of the Orenburg complex began in 1975. This stage will consist of 100 operational wells. Under a contract signed in September 1975, Creusot-Loire is to supply the U.S.S.R. with equipment for the extraction and field processing of 15 billion cubic meters of gas per year. The equipment will be used in the third stage of the Orenburg gas complex. Reportedly, the French Technip firm and Soviet Techmashimport have signed a 1-billion-franc contract for a natural gas desulfurizing plant, which will form the third stage of the Orenburg gas complex. The plant is to have a processing capacity of 17 billion cubic meters of gas per year, the same as that of the first two, which were also constructed by Technip. The third stage of the Orenburg gas complex is to go into operation in 1978.

Production of gas at the Vukytl condensate gasfield in Komi A.S.S.R. increased from 0.9 billion cubic meters in 1964 to an estimated 17 billion cubic meters in 1975.

Soviet natural gas statistics are presented in table 12.

Petroleum.—The U.S.S.R. continued to be the leading petroleum-producing country in the world in 1975. Crude oil and gas condensate output in 1975 increased 31.8 million tons, or 7%, to a total 491 million tons. The Soviet Union continued to expand exports of crude oil and petroleum products even though supplies for internal consumption have been critically short. Exports rose to 95.8 million tons in 1970, to 116.2 million tons in 1974, and to 130.4 million tons in 1975. About 60% of the total exports was sent to other centrally planned economy countries. The oil exports provide the U.S.S.R. with much of its convertible currency earnings, which were increasingly needed to pay for expanding imports of Western machinery and equipment. Soviet imports of crude oil and petroleum products increased from 4.6 million tons in 1970 to 14.7 million tons in 1973 and dropped sharply to 5.4 million tons in 1974 and 7.5 million tons in 1975.

In 1975, over 500 (including 36 large) oil and gas condensate fields were in operation with a total of 64,843 producing and about 10,000 injection wells. Out of the 64,843 producing wells, 60,172, or 92%, were active. The average crude output per well was 20.4 tons per day in 1975.[6] During 1971–75 about 9,500 producing wells were put into operation.

All three primary methods of crude oil production (flowing, 8,903 wells; pumping, 53,140 wells; and gas lifting, 2,800 wells) were used, and secondary recovery methods (repressuring and waterflooding) were employed at many other fields in the Soviet Union. Production of crude by the flowing method decreased from 53.4% of the total in 1971 to 45.1% in 1974. It is expected that by 1980 only 37% of the Soviet total will be produced by the flowing method. Waterflooding increased from 560 million cubic meters in 1970 to 887 million cubic meters in 1974, and second-

[6] Neftyanoye khozyaystvo (Oil Economy), Mcscow. No. 4, April 1976, pp. 3–5.

Table 12.—U.S.S.R.: Salient natural gas statistics

(Billion cubic meters)

	1970	1974	1975	1980 forecast
Production	197.9	260.6	289.0	435.0
Exports:				
To West Europe:				
Austria	1.0	2.1	1.9	2.0
West Germany	--	2.1	3.1	8.5
Italy	--	.8	2.3	6.0
Finland	--	.5	.7	1.4
France	--	--	--	4.0
Total	1.0	5.5	8.0	21.9
To East Europe:				
Czechoslovakia	1.3	3.2	3.7	6.0
Poland	1.0	2.1	2.5	4.5
East Germany	--	2.9	3.3	5.0
Hungary	--	--	.6	3.8
Bulgaria	--	.3	1.2	6.3
Romania	--	--	--	1.5
Yugoslavia	--	--	--	1.0
Total	2.3	8.5	11.3	28.1
Grand total exports	3.3	14.0	19.3	50.0
Imports:				
From Iran	1.1	9.0	9.6	11.0
From Afghanistan	2.5	2.9	2.9	4.0
Total imports	3.6	11.9	12.5	15.0
Net exports	—.3	2.1	6.8	35.0
Apparent consumption	198.2	258.5	282.2	400.0

Source: Production data for 1970 and 1974 taken from the National Economy of the U.S.S.R., Moscow, 1970 and 1974; production data for 1975 reported in Pravda, Moscow, Feb. 1, 1976, p. 1; trade data from Foreign Trade of the U.S.S.R., Moscow, 1970, 1974, and 1975; 1980 forecast based on 5-year plan and delivery contracts.

ary recovery increased from 52 million tons to 280 million tons for the same period.[7]

During 1971–75, fuel and power production were increased annually by 65 million to 70 million tons of standard fuel equivalent, over half of which was provided by petroleum; 25,500 developmental and exploratory wells were drilled; and over 18,000 kilometers of trunk pipelines were placed in operation. During the same period, capital investment in crude oil production reached over 18 billion rubles, of which about 4 billion rubles was invested in 1975. The return on capital in 1975 was reduced 15% from that of 1970, corresponding to an estimated loss of more than 1 billion rubles in 1975; at the same time the average well production had grown from 18.5 tons to 20.6 tons per day, which should have raised the return on capital 7.4%.[8]

Crude oil extraction occupied 740,000 persons, including some 650,000 workers, 35,000 university graduate engineers, and 55,000 graduate technicians.[9] The total number of workers engaged in drilling reached about one-fifth of all workers in the crude oil production industry. The industry had 33 research and design establishments with a total staff of 25,000 persons. Expenditures for scientific research exceeded 90 million rubles per year.

The expansion of Soviet petroleum production was achieved through the use of a large number of rigs and the liberal use of manpower and materials. The production of petroleum equipment has grown substantially, but the technical standards and the quality of machinery and equipment produced are poor. Productivity and reliability of the equipment used in crude oil extraction are low. Drilling pipe used in 1975 (Government standard GOST 631–63) had low strength and inadequate sealing. In Western countries such products have long since been taken out of production; in the U.S.S.R., however, low productivity and obsolete equipment are still being included in plans.[10]

Reportedly, the value of Soviet imports of Western equipment for oil and gas exploration and production increased from $43 million in 1974 to $176 million in 1975. The value of U.S. exports to the U.S.S.R. jumped from $0.5 million in 1974 to $47 million in 1975. As a result, the United States became the leading supplier of petroleum-related equipment and facilities to the U.S.S.R., followed by West Germany, Romania, France, and the United Kingdom.

It was planned to put the following facilities into operation during 1975: Crude oil collection, 87.2 million tons; crude oil preparation, 69 million tons; petroleum pipeline, 2,750 kilometers; and developmental drilling (4,300 wells), 8.5 million meters. An investment of 2.7 billion rubles was planned for production facilities and oilfield exploration.

Development of the first underground oil-producing mine, with an annual capacity of up to 300,000 tons, is to begin in Azerbaydzhan in 1976; completion is scheduled for 1980. The crude is to be mined at a depth of 400 meters from two vertical shafts.

The annual Soviet crude and gas condensate production increase amounted to 28.6 million tons in 1973, 29.9 million tons in 1974, and 32.1 million tons in 1975. Production of crude oil (including gas condensate) is slated to rise to 520.6 million tons in 1976 and to 640 million tons in 1980.

Reportedly, the Soviet Oil Industry Minister has proposed to U.S. 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 that the U.S.S.R. is ready to pay for this cooperation.

Oilfields and Crude Oil Production.—During 1971–75 70% of the total petroleum was produced in the European part of the U.S.S.R. The Ural-Volga area continued to be the Soviet Union's major producing area, supplying nearly half of the nation's crude output in 1975. Most of the U.S.S.R.'s increased production is, however, derived from the West Siberian fields, where 148 million tons was pro-

[7] Ekonomika neftyanoy promyshlennosti (Economics of Petroleum Industry). Moscow. No. 7, July 1976, pp. 3–4.
Neftyanoye khozyaystvo (Oil Economy), Moscow. No. 4, April 1976, pp. 3–5.

[8] Ekonomika neftyanoy promyshlennosti (Economics of Petroleum Industry), Moscow. No. 7, July 1976. pp. 9, 30–32.

[9] Ekonomika neftyanoy promyshlennosti (Economics of Petroleum Industry), Moscow. No. 7, July 1976, pp. 3–4.
Neftyanoye khozyaystvo (Oil Economy), Moscow. No. 4, April 1976, pp. 3–5.

[10] Trud (Labor), Moscow. Oct. 24, 1975, p. 2.

duced in 1975. The Ural-Volga area will continue to lead until the developing oilfields of Siberia, Mangyshlak, and Turkmenistan come into their own. West Siberia was the second largest producer, followed by the North Caucasus and Kazakhstan.

Among the oil-producing regions, Tyumen' Oblast' held the leading place, followed by Tatar A.S.S.R., Bashkir A.S.S.R., Kuybyshev Oblast', Perm Oblast', and the Mangyshlak Peninsula in Kazakhstan. Of the country's 26 oil-producing regions, 24 regions met the 1975 production quotas. The Komi and Azerbaydzhan oil-producing associations did not meet the 1975 production targets.

There were 139 oilfields in Tyumen' Oblast' on December 31, 1975; 54 of them were discovered during 1971–75, including 10 oilfields in 1975. But only 15 oilfields were in operation in 1975, including the Kholmogorskoye Field which was put into operation in August 1975. The Samotlor oilfield in Tyumen' Oblast', the largest oilfield in the U.S.S.R., accounted for more than 50% of the oil extracted in West Siberia. More than 1,200 developmental wells were in operation at this field in 1975. Discovered in 1965, the Samotlor Field began commercial production in 1969 and produced 218 million tons during 1971–75. Production was 224,000 tons per day in 1975.

Since the development of the Pravdinsk Field in Tyumen' Oblast' began, 25 million tons of crude had been produced. The output at this field was 18,500 tons per day in 1975. The Southern Surgut oilfield, which was discovered in 1973, is among the largest fields in Tyumen' Oblast'; 23 developmental wells were put into operation in 1974–75. During the same period over 300 wells were drilled and more than 30 million tons of crude was extracted from the Sovietsko-Sosninsk Field in Tomsk Oblast'. It is planned to produce 180 million tons of crude oil in West Siberia in 1976 and 300 million to 310 million tons in 1980.

In the Ural-Volga area, the so-called Second Baku, output was concentrated in three regions: Tataria, Bashkiria, and Kuybyshev Oblast'. Tatar A.S.S.R. produced 1,472 million tons of crude oil in 1943–75 and for 17 years this region has been the main Soviet petroleum producer. Some 103.7 million tons of crude was produced in 1975. The Romashkino oilfield is the largest in this Republic. During 1971–75, about 5,000 developmental wells were drilled in Tatar A.S.S.R. In 1976, this region is to produce 101 million tons of crude. Bashkir A.S.S.R. produced around 40 million tons of crude in 1975. Udmurt A.S.S.R. had the second (after West Siberia) fastest growth rate for crude production in the country. Output of crude increased from 475,000 tons in 1970 to 3.7 million tons (from 458 wells) in 1975. Up to 1975, 24 oilfields were surveyed in Udmurt A.S.S.R., of which 5 were in operation in 1975. Perm Oblast', in the Ural-Volga area, produced 22.1 million tons of crude, and Orenburg Oblast' extracted 22.2 million tons in 1975.

Kazakhstan produced over 24 million tons of crude in 1975. Of this, 20.1 million tons came from the Mangyshlak Peninsula, where over 600 developmental wells were put into production during 1971–75. Oil output in Belorussia rose from 4.2 million tons in 1970 to over 8 million tons in 1975. There were over 300 developmental wells in this Republic in 1975; they produced over 23,000 tons of crude per day. Komi A.S.S.R.'s crude output increased from 5.6 million tons in 1970 to 7.1 million tons in 1975. For several years crude production on Sakhalin Island was held at about 2.4 million tons per year.

In Azerbaydzhan, for the past several years the extraction of crude oil has been declining. The reduction in output is taking place at the onshore and offshore fields.

Shifts in Soviet actual and planned production of crude oil are shown in table 13.

Refining and Petroleum Products Supply.—The petroleum refining and petrochemical industry developed widely as a large independent industry in the 10 years following its establishment in 1965. According to the volume of products sold by this industry, it occupied second place (after the ferrous metallurgy industry) among the heavy industries of the U.S.S.R.[11] There are three steps in the new management structure of the Soviet petroleum refining and petrochemical industry.

[11] Partiynaya zhizn' (Party Life), Moscow. No. 18, September 1975, pp. 16–24.

Table 13.—U.S.S.R.: Production of crude oil by region in selected years from 1940 to 1980

(Percent)

Region	Actual					Planned	
	1940	1950	1960	1965	1970	1975	1980
R.S.F.S.R	22.6	48.0	80.4	82.3	80.7	80.3	86.7
Of which—							
Ural-Volga	5.9	29.1	70.6	71.5	59.7	44.7	35.2
Of which—							
Kuybyshev Oblast'	.7	9.3	15.1	13.8	10.0	6.8	5.4
Bashkir A.S.S.R	4.6	14.9	17.1	16.7	11.7	8.0	6.2
Tatar A.S.S.R	--	2.3	31.3	32.8	28.8	20.2	15.9
Perm Oblast'	.5	.8	1.5	4.0	4.6	4.0	3.6
Orenburg Oblast'	.1	.6	.9	1.1	2.1	2.8	2.2
Volgograd Oblast'	--	--	3.2	2.4	2.0	1.5	1.1
North Caucasus	14.8	16.0	8.2	8.5	9.7	7.4	3.1
Of which—							
Checheno-Ingush A.S.S.R	7.2	6.4	2.2	3.7	5.8	4.5	1.5
Komi A.S.S.R	.2	1.4	.5	.9	1.6	2.4	1.4
West Siberia	--	--	--	--	9.0	25.2	47.0
Ukrainian S.S.R	1.1	.8	1.5	3.1	3.8	3.3	1.8
Belorussian S.S.R	--	--	--	.15	1.2	1.7	1.5
Kazakh S.S.R	2.2	2.8	1.1	.8	3.7	6.0	5.0
Azerbaydzhan S.S.R	71.4	39.2	12.1	8.9	5.7	3.8	2.8
Uzbek S.S.R	.4	3.1	1.1	.7	.5	.3	.1
Turkmen S.S.R	1.9	5.3	3.6	4.0	4.1	4.4	2.0
Other	.4	.8	.2	.1	.3	.2	.1
Total U.S.S.R	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Ekonomika neftyanoy promyshlennosti (Economics of Petroleum Industry), Moscow. No. 8, August 1973, p. 7; No. 9, September 1975, p. 46. Neftyanik (Oil Man), Moscow. No. 5, May 1976, pp. 1–4.

One scientific automation and 14 production associations were established in 1975.

Information pertinent to refining and utilizing petroleum products is a State secret, and material on the subject is not available. However, a great deal of indirect information is available. For many years Soviet practices in dehydration, desalting, and crude stabilization have lagged behind the technical level of other countries.

Most of the pipelines in West Siberia operate according to an oilfield-pipeline-refinery pattern. Under such conditions water and other impurities in the crude have amounted to several million tons. Moreover, even a short-term shutdown of a pipeline causes wells in the fields to be cut off and affects the performance of refineries.[12] Water content in crude received by the Soviet refineries ranged from 0.5% to 2% (average 0.76%), with 1,000 to 5,000 milligrams of chloride salts per liter (average 739 milligrams), while the norm permits only 0.2% water and 40 milligrams of salt per liter.[13] As a result of inadequate pretreatment of crude, according to Soviet sources, refinery consumption and losses amount to 13.4%.[14] The total loss incurred by refining insufficiently desalinated crude oil is more than 200 million rubles per year.[15] Losses in storage and transportation of crude oil to refineries are estimated at 1.6%.

While the Soviets do not publish output figures for petroleum products, reasonable estimates can be derived by assuming a yield of 85% of the reported crude petroleum input. Thus, Soviet output of refined products from crude oil (including condensate) in 1975 has been estimated at 344 million tons. Based upon production and trade figures, Soviet consumption of refined products in 1975 has been estimated at about 308 million tons.

The 1971–75 plan envisaged a 40% increase in product output by 1975 as compared with 1970 output. This goal was not met. Estimated refinery capacity at yearend totaled 380 million tons per year,

[12] Pravda, Moscow. Oct. 25, 1975, p. 2.

[13] Khimiya i tekhnologiya topliv i masel (Chemistry and Technology of Fuels and Lubricants), Moscow. No. 8, August 1972, pp. 1–5; No. 1, January 1975, pp. 1–6.

[14] Promyshlennaya energetika (Industrial Power Engineering), Moscow. No. 2, February 1968, p. 3.

[15] Ekonomika neftyanoy promyshlennosti (Economics of Petroleum Industry), Moscow. No. 1, July 1975, pp. 12–13.

Sotsialisticheskaya industriya (Socialist Industry), Moscow. June 3, 1970, p. 1.

an increase of 85 million tons over the 1970 level.

With the assistance of Western firms, additional facilities for primary processing of oil and catalytic reforming at the Kherson, Kirishi, Novo-Ishimbay, Perm, Kremenchug, Angarsk, Omsk, Fergana, Polotsk, Ryazan', Khabarovsk, Ukhta, Saratov, Novokuybyshev, Mozyr, Novo-Gor'kiy, Novo-Ufa, and Groznyy imeni Sheripova refineries and at the Nizhnekamsk petrochemical complex were put into operation during 1971–75. In 1975, the following new oil refineries were under construction: Achinsk, Tobolsk, Tomsk, Lisichansk, Pavlodar, Mazeikiai, and Chardzhou. Plans have been drawn up for the construction of a large refinery near Nakhodka in the Soviet Far East. Most of the refinery's output will be exported.

Reportedly, the Soviet Ministry for Oil Refining and the Petrochemical Industry has asked the Pullman Kellog Corp. of the United States to submit proposals for construction of eight major petroleum refineries and four auxiliary installations. The total cost for all 12 units is estimated at over $3 billion. At the same time, the U.S.S.R. is to supply equipment for an oil refinery under construction with Soviet technical assistance at Mysore, India.

The 1980 petroleum product supply picture is reasonably clear. The output of petroleum products from crude oil would be 443 million tons, based upon 85% of the estimated crude petroleum input. A reasonably accurate consumption estimate of 399 million tons is based on the 5-year plan figures of industrial and other uses until 1980. Meanwhile, Soviet imports of petroleum products are expected to reach about 1 million tons. Thus, the supply balance shows that approximately 45 million tons of petroleum products could be available for export in 1980.

Actual and estimated exports of crude oil and products from the U.S.S.R. to European COMECON countries are shown in table 14. Soviet petroleum statistics are shown in table 15.

Table 14.—U.S.S.R.: Exports of crude oil and products to COMECON nations in East Europe

(Million metric tons)

	Czecho-slovakia	Poland	Bulgaria	East Germany	Hungary	Total
1960:[1]						
Crude oil	2.4	0.7	--	1.8	1.4	6.3
Products	.3	1.4	0.8	.4	.1	3.0
Total	2.7	2.1	.8	2.2	1.5	9.3
1965:[1]						
Crude oil	6.0	3.2	2.1	4.9	2.0	18.2
Products	.4	1.5	1.3	.5	.4	4.1
Total	6.4	4.7	3.4	5.4	2.4	22.3
1970:						
Crude oil[e]	9.5	6.6	5.0	8.8	3.8	33.7
Products[e]	1.0	2.0	2.0	.5	1.0	6.5
Total[1]	10.5	8.6	7.0	9.3	4.8	40.2
1975:						
Crude oil[e]	15.0	11.0	9.0	14.0	6.0	55.0
Products[e]	1.0	2.3	2.6	1.0	1.5	8.4
Total[1]	16.0	13.3	11.6	15.0	7.5	63.4
1980[e]						
Crude oil	19.8	16.7	12.9	18.3	8.3	76.0
Products	1.2	2.7	3.6	1.3	2.2	11.0
Total	21.0	19.4	16.5	19.6	10.5	87.0

[e] Estimate.
[1] Reported in Foreign Trade of the U.S.S.R., Moscow, 1960, 1965, 1970, and 1975.

Table 15.—U.S.S.R.: Salient petroleum statistics

(Million metric tons)

	Actual				1980 [e]
	1960	1965	1970	1975	
Crude oil (including gas condensate):					
Domestic output	147.9	242.9	353.0	491.0	640
Of which gas condensate	1.2	2.8	5.0	8.0	12
Imports	1.2	--	3.5	6.5	10
Exports:					
To other centrally planned economy countries	8.8	22.9	38.1	[e] 64.9	100
To market economy countries	9.0	21.0	25.8	[e] 28.2	30
Total	17.8	43.9	63.9	93.1	130
Crude product conversion:					
Crude oil to refineries	131.3	199.0	292.6	404.4	520
Refinery capacity [e]	153.0	225.0	295.0	380.0	475
Refined oil:					
Output from crude [e]	130.0	169.0	250.0	344.0	443
Imports	3.2	1.9	1.1	1.1	1
Exports:					
To other centrally planned economy countries	6.4	6.5	10.0	[e] 13.0	16
To market economy countries	9.0	14.5	19.0	[e] 24.3	29
Total	15.4	21.0	29.0	37.3	45
Apparent consumption	117.8	149.9	222.1	307.8	399

[e] Estimate.

Sources: Production data 1960, 1965, 1970, and 1975 taken from the National Economy of the U.S.S.R., Moscow, 1960, 1965, and 1970; and Pravda, Moscow, Feb. 1, 1976, p. 1. Trade data from Foreign Trade of the U.S.S.R., Moscow, 1960, 1965, 1970, and 1975.

Other Fuels and Energy.—Among the other fuels and energy of lesser significance in the energy economy in 1975 were hydroelectric power, nuclear energy, oil shale, peat, and fuelwood. Peat (fuel), oil shale, and fuelwood together accounted for 7.7% of the total Soviet fuel production in 1960, but by 1975 their aggregate share had fallen to an estimated 3%. There was, in fact, an absolute increase in the production of these commodities, a trend which is expected to continue into the future.

Hydroelectric Power.—The economic technical potential of hydroelectric power in the U.S.S.R. was placed at 1,095 billion kilowatt-hours per year. In the overall energy economy of the Soviet Union, however, water power is of relatively small significance. Hydroelectric power supplied 138 billion kilowatt-hours or 13% of all electric power generated in 1975.

At the beginning of 1976, the total installed capacity of Soviet electric powerplants reached 218 million kilowatts, of which 40.8 million kilowatts represented hydroelectric capacity and about 5.1 million kilowatts nuclear capacity. Most of the future development of electric power capacity will be centered on new thermal electric powerplants, most of which will be fueled by lignite. There are plans to commission 12.19 million kilowatts of new electric-power generating facilities in 1976, including 8.48 million kilowatts thermal, 1.01 million kilowatts nuclear, and 2.7 million kilowatts hydraulic capactiy. Under the 1976–80 plan, 71 million kilowatts of new electric power generating facilities are to be commissioned and are scheduled to produce 1,380 billion kilowatt-hours of electric power annually by 1980. The output of hydroelectric power may reach 197 billion kilowatt-hours by 1980. In 1980, the capacity of hydroelectric powerplants may reach approximately 54 million kilowatts. Capital investment in construction of new powerplants for the next 5 years has been set at 26 billion rubles, compared with 22 billion rubles under the 1971–75 plan.

Nuclear Power.—The Soviet Union operated eight atomic powerplants with a total capacity of 4,052 megawatts, or about 2% of the capacity of all electric powerplants in the country on January 1, 1975. Novo-Voronezh had four reactors, total capacity 1,455 megawatts; Beloyarsk, two reactors, 300 megawatts; Melekess, one reactor, 50 megawatts; the Kola Peninsula two reactors, 880 megawatts; Shevchenko, one reactor, 350 megawatts; Bilibino, one reactor, 12 megawatts; Leningrad, one reactor, 1,000 megawatts; and Obninsk, one reactor, 5 megawatts. In 1975, the following nuclear powerplants were put into operation: The second stage (one reactor) at Bilibino with a capacity of 12 megawatts commissioned in January, and the third stage (one reactor) at this powerplant, with the same capacity, completed December 31; and the second stage (one reactor) at Leningrad, with a capacity of 1,000 megawatts, put into operation in November. Therefore, the total installed capacity of all eight Soviet nuclear powerplants on January 1, 1976, was 5,076 megawatts, or 2.3% of the capacity of all electric powerplants in the U.S.S.R.

In 1975, Soviet nuclear powerplants generated about 20 billion kilowatt-hours (25% more than in 1974; 80% of the 1975 planned quota), or 1.9% of all power supplied in 1975. Several nuclear powerplants were under construction in 1975, and some of these were scheduled for completion in 1980. It is planned to install 13,750 megawatts of new nuclear capacity by 1980 and to generate 80 billion kilowatt-hours of nuclear electricity in 1980. The estimated level of Soviet nuclear generating capacity for 1980 is about 17,500 megawatts. The U.S.S.R. will probably increase the production of nuclear power from an estimated 20 billion kilowatt-hours in 1975 to 65 billion kilowatt-hours in 1980. Nuclear power output is to represent about 4.7% of national electric power production and 0.4% of total Soviet primary energy output by 1980.

According to Soviet sources, construction and initial fueling of nuclear power stations is more expensive than that of conventional thermal powerplants of similar capacity. However, operating costs at nuclear power stations are being constantly reduced, particularly at the large-capacity stations. Thus, the generation cost of 1 kilowatt-hour at the Novo-Voronezh nuclear powerplant was reduced from 0.95 ruble in 1971 to 0.65 ruble in 1975.

Soviet nuclear energy statistics are presented in the following tabulation:

Nuclear plant and unit	Startup date	Capacity (megawatts)	
		Actual Jan. 1, 1976	Estimated Dec. 31, 1980
Obninsk	1954	5	--
Beloyarsk No. 1	1964	100	--
Beloyarsk No. 2	1967	200	--
Beloyarsk No. 3	--	--	600
Novo-Voronezh No. 1	1964	210	--
Novo-Voronezh No. 2	1970	365	--
Novo-Voronezh No. 3	1971	440	--
Novo-Voronezh No. 4	1972	440	--
Novo-Voronezh No. 5	--	--	1,000
Melekess	1965	50	--
Shevchenko No. 1[1]	1973	350	--
Bilibino No. 1	1973	12	--
Bilibino No. 2	1975	12	--
Bilibino No. 3	1975	12	--
Bilibino No. 4	--	--	12
Kola Peninsula No. 1	1973	440	--
Kola Peninsula No. 2	1974	440	--
Kola Peninsula No. 3	--	--	440
Armenia No. 1	--	--	440
Armenia No. 2	--	--	440
Leningrad No. 1	1974	1,000	--
Leningrad No. 2	1975	1,000	--
Leningrad No. 3	--	--	1,000
Leningrad No. 4	--	--	1,000
Kursk No. 1	--	--	1,000
Kursk No. 2	--	--	1,000
Kursk No. 3	--	--	1,000
Kursk No. 4	--	--	1,000
Smolensk No. 1	--	--	1,000
Chernobyl No. 1	--	--	1,000
Rovny No. 1	--	--	440
South Ukrainian No. 1	--	--	1,000
New capacity	--	5,076	12,372
Total capacity	--	5,076	17,448

[1] The first dual-purpose nuclear powerplant using a sodium-cooled fast reactor with a designed capacity of 150,000 kilowatts and desalination capacity of 120,000 cubic meters per day of fresh water.

The U.S.S.R. is embarked on a major 5-year nuclear power expansion program. The reactors are to be installed in 10 new nuclear powerplants to be built under the 1976–80 plan. Each plant will have a projected capacity of 1 million kilowatts. The standard nuclear reactor now being produced at the Izhorsk plant in Leningrad is a 440-megawatt pressurized water reactor. Using this model, the U.S.S.R. can turn to the West for the supply of equipment and technology for its nuclear industry. The Soviets are interested in key components and equipment to be manufactured in West Europe, Japan, and the United States.

The Soviet Union has meanwhile embarked on a program to develop its own heavy-machine-building facilities. The key to this program is the establishment of a very large reactor production plant near Volgodonsk on the River Don. The new complex, to be known as Atommash ("atomic machines"), will specialize in serial production of 1,000-megawatt reactors and other equipment for nuclear powerplants. The first stage of the plant is to be onstream in 1978, and completion of the plant is scheduled for 1980.

The U.S.S.R. provided technical assistance in the construction of nuclear 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, with a capacity of 440 megawatts, was put into operation in December 1973; the second stage of this plant (with the same capacity) was completed in December 1974.

In December 1972, the first Czechoslovak 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 1975. The technical project of a second nuclear powerplant in this country, 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 1975, and the second one, with the same capacity, is to be put into operation in 1976. Construction of similar nuclear powerplants, with a capacity of 440 megawatts each, began in Hungary (Paks nuclear powerplant) and Romania in 1974 and is 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 power station is to be built in Las Villas Province with Soviet assistance.

The first stage of the Loviisa nuclear powerplant in Finland, with a capacity of 440 megawatts, was under construction with Soviet assistance in 1975. Under a Finnish-Soviet agreement, the main machinery, reactor units, and turbines, as well as the nuclear fuel, will be delivered by the Soviet foreign trade organization Atomenergoexport. The Finns are responsible for the actual construction work and for delivering various components and electrical equipment. Reportedly, 750 Soviet engineers, technicians, and mechanics who are helping with nuclear powerplant construction have been living at the construction site.

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, Rheinische-Westfälisches Elektrizitätswerk AG has a contract with the Soviet Union, worth DM1 billion and valid until 1990, that will ensure a sufficient supply of uranium for the nuclear powerplants. The contract for the enrichment of uranium for Austria's second nuclear power project for the 12-year period was signed by the U.S.S.R. on May 23. This nuclear powerplant is scheduled for operation in 1980 or 1981.

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 33.3 million tons in 1974 to an estimated 34 million tons in 1975. The output of oil shale may possibly reach 35 million tons in 1976 and 38 million tons in 1980. Over two-thirds of the extracted shale in the U.S.S.R. is burned at the Pribaltiyskaya and Estonskaya 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 Estonian S.S.R., where output totaled over 27 million tons in 1975 and is expected to be about 30 million tons in 1980. There were eight underground mines and four open pits in operation in Estonia in 1975. Some Estonian oil shale went for chemistry needs, while 23 million tons was used directly for the production of electricity and heat.

In 1975, three underground oil shale mines in Leningrad Oblast' produced some 5 million tons, and over 1 million tons of oil shale came from the Volga region.

Most of Estonia's oil shale comes from thin seams at a depth of 20 to 30 meters. An increasing proportion is obtained from open pits. The future development of the Republic's oil shale industry is impeded by the following factors: Limited reserves of untapped shale deposits, shortage of manpower, limited capacity of existing petrochemical enterprises and environmental protection. According to Soviet sources, both dust and pollution of air, rivers, and ground water at many places in the Estonian oil shale basin exceed permissible standards. It has been decided to begin the development of the middle-Dnepr oil shale deposit, which has been estimated to contain over 3 billion tons of oil shale.

Reportedly Thailand has accepted an offer from the Soviet Union of technical assistance for oil shale development.

Peat.—The Soviet Union produced an estimated 192 million tons of peat in 1975. Of this quantity, 60 million tons consists of fuel peat and 132 million tons of agricultural peat. The latter includes production of 45 million to 50 million tons from collective farms, some of wihch may be used for local fuel. The R.S.F.S.R. occupied first place in the production of peat in the U.S.S.R. and produced some 112 million tons, including an estimated 35 million tons of fuel peat. Belorussian S.S.R., with an estimated output of 42 million tons was the second largest peat-producing region.

Soviet gross reserves of peat were increased between 1955 and 1975 from about 20 billion tons to 39 billion tons of standard fuel equivalent. However, about 11% of today's minable reserves are located in the European part of the U.S.S.R., Belorussia, the Baltic States, and the Ukraine, which together produced over 80% of the national output in 1975. Analysis of past trends and Soviet potential facilities indicate that extraction of peat may reach 200 million tons (including 65 million tons of fuel peat) in 1980.

Reserves and estimated production of peat by the Soviet Union, in 1975 follow:

Republic	Reserves (billion metric tons)	Production (million metric tons)
R.S.F.S.R.:		
North-West	19.8	19.1
Center	5.3	44.8
Volga-Vyatka	2.0	20.6
Volga	.3	10.1
Urals	9.1	9.7
West Siberia	103.9	3.6
East Siberia	4.0	1.1
Soviet Far East	5.2	2.0
Other	.3	1.0
Total	149.9	112.0
Ukrainian S.S.R	2.3	27.6
Belorussian S.S.R	5.4	41.9
Georgian S.S.R	.1	.2
Lithuanian S.S.R	.8	3.4
Latvian S.S.R	1.7	5.3
Estonian S.S.R	2.3	2.6
Grand total U.S.S.R	162.5	193.0

Sources: Planovoye khozyaystvo (Planned Economy), Moscow. No. 3, March 1975, p. 124. Torfyanaya promyshlennost' (Peat Industry), Moscow. No. 6, June 1975, pp. 20–23.

There were 70 electric powerplants fueled by peat, with a total capacity of about 4,000 megawatts, in operation in the U.S.S.R. in 1975. A number of new powerplants, with a capacity of 600 megawatts each, were being constructed in different regions of the U.S.S.R. in 1975. Fuel peat is also used in domestic heating.

The Mineral Industry of the United Kingdom

By William F. Keyes [1]

The United Kingdom experienced its deepest recession of the post-World War II period in 1975. The gross domestic product fell 1.6% in real terms, and industrial production declined 4.8%, falling back to 1970 levels; unemployment reached the high level of 1.2 million in December (5% by official reckoning). Retail price inflation in 1975 was 24.2%. Government expenditure was the main buoyant element in the economy, but by yearend there were a few encouraging signs of recovery, particularly in chemicals and light industry.

The minerals and metallurgical sector participated in the general recession. The steel industry operated far below capacity and nonferrous metals smelter production, particularly of aluminum, copper, lead, and zinc, declined. Limited potash ore production began after a considerable delay. The chief hopeful prospect was for imminent growth in petroleum production, which began in 1975, and for increases in natural gas supplies, which already provided virtually all the United Kingdom's requirements. It was forecast that the United Kingdom would be self-sufficient in energy by the 1980's and might have an exportable surplus of hydrocarbons as well.

The mining industry of the United Kingdom was small by world standards, and production consisted primarily of coal, iron ore, certain other industrial minerals and metals, and construction aggregate materials. Recognizing that future mineral production would have to be carefully planned, the Government established the Stevens Committee in September 1972 to examine planning control and to recommend improvements; the report [2] was completed in 1975.

Some of the chief recommendations of the report may be summarized as follows: No separate planning control system for minerals is needed. The existing planning law (the Town and Country Planning Act 1971), which invests local governments (the county councils) with authority for land planning, should be amended to provide the councils with qualified minerals planning staff, probably to be shared among several counties. The Departments of Industry and of the Environment should coordinate the county planning to insure respectively that the national interests are considered and that definitive environmental policies are followed. Consultative committees, on which both the county councils and the mine operators are represented, should be established to consider proposed development in any "mineral consultation areas." Exploration activities should become "permitted development," requiring only notification of the local authorities. Another major recommendation was that progress in land restoration after mining be monitored for 10 years but that no financial guarantees be required unless, after that period, a review found it necessary.

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[1] Supervisory physical scientist, International Data and Analysis.

[2] Planning Control Over Mineral Workings. Her Majesty's Stationery Office, London, 1976, 448 pp.

PRODUCTION

The production index for mining and quarrying rose in 1975, but was still well below the 1970 base year. Other manufacturing indexes all showed declines, as given below:

	1974 r	1975
Mining and quarrying	79.0	86.0
Manufacturing:		
Ferrous metals	87.7	74.2
Nonferrous metals	104.2	92.2
Brick, pottery, glass, etc	117.5	108.5
Chemicals	127.7	115.6
Coal and petroleum products	106.0	92.0
All industry	106.1	100.9

r Revised.

Source: Central Statistical Office (London). Monthly Digest of Statistics. No. 364, April 1976, pp. 49–52.

Table 1.—United Kingdom: Production of mineral commodities
(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Aluminum:			
Alumina	97	95	83
Metal:			
Primary	252	294	308
Secondary	210	207	176
Antimony, primary smelter [1] metric tons	e 7,800	NA	NA
Cadmium metal including secondary do	314	280	262
Copper:			
Ore and concentrate, metal content do	459	434	457
Refined:			
Primary do	75,858	69,096	75,500
Secondary do	r 94,965	91,027	76,000
Iron and steel:			
Iron ore	7,105	3,602	4,490
Pig iron	16,679	13,811	12,046
Ferroalloys, blast furnace:			
Ferromanganese	145	83	85
Spiegeleisen	15	8	([2])
Total	160	91	85
Steel:			
Crude	26,649	22,426	20,198
Semimanufactures:			
Sections	r 5,906	5,658	4,765
Wire rods	1,790	1,549	1,415
Plates and sheets	r 9,761	7,967	6,217
Strip	1,757	1,121	1,031
Pipe tube and stock	840	739	828
Railway track material	255	285	344
Other rolled [3]	1,052	1,027	973
Castings and forgings	350	398	391
Total	21,711	18,744	15,964
Lead:			
Mine output, metal content metric tons	r 3,672	3,600	6,396
Metal:			
Bullion, from imported ores and concentrates do	30,306	29,380	25,700
Refined:			
Primary [4] do	120,117	136,994	105,100
Secondary [5] do	145,009	139,916	123,400
Total do	265,126	276,910	228,500
Magnesium metal including secondary do	3,100	3,800	2,800
Nickel metal, refined, including ferronickel do	36,800	33,698	37,300

See footnotes at end of table.

Table 1.—United Kingdom: Production of mineral commodities—Continued
(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS—Continued			
Silver metal ---- thousand troy ounces	--	--	140
Tin:			
Mine output, metal content ---- metric tons	3,783	3,827	3,330
Metal: [2]			
Primary ---- do	r 20,404	11,818	11,500
Secondary ---- do	r 2,659	3,561	5,600
Tungsten, mine output, metal content ---- do	r 13	10	10
Zinc:			
Ore and concentrate, metal content ---- do	2,909	3,008	4,001
Smelter ---- do	r 83,810	84,351	53,400
NONMETALS			
Barite and witherite	59	50	51
Bromine ---- metric tons	30,600	27,200	28,300
Calcite	r 20	21	19
Cement, hydraulic	19,986	17,781	16,891
Chalk	r 22,160	20,415	17,890
Clays:			
Fire clay	r 1,832	2,277	1,535
Fuller's earth e	185	166	164
Kaolin (china clay)	3,409	4,290	3,220
Potter's and ball clay	755	8	12
Other including clay shale	r 33,945	30,337	26,748
Diatomite ---- metric tons	4,000	4,000	3,500
Feldspar (china stone) ---- do	49,000	e 50,000	e 50,000
Fertilizers, manufactured: [6]			
Nitrogenous (N content)	751	755	840
Phosphatic (P_2O_5 content)	467	438	412
Other, gross weight	2,786	2,837	2,595
Fluorspar:			
Acid grade	120	124	127
Metallurgical grade	49	36	33
Ungraded	r 10	15	19
Total	r 179	175	179
Gypsum, plaster and anhydrite	5,333	4,901	[7] 3,479
Refractory products: [8]			
Bricks	925	941	824
Cement	45	47	62
Other	129	131	417
Salt:			
Rock	1,121	990	754
Brine	1,643	1,862	1,740
Other	5,754	5,569	5,136
Stone, sand and gravel:			
Stone:			
Chert and flint	141	160	NA
Igneous rock	r 47,625	41,717	42,827
Limestone and dolomite	r 108,404	100,915	101,175
Sandstone including ganister	r 16,912	14,380	12,598
Slate	64	64	58
Sand and gravel:			
Common sand and gravel	136,000	120,300	134,085
Special sands	r 6,775	4,612	6,041
Strontium minerals ---- metric tons	r 4,300	2,400	1,900
Sulfur:			
Elemental	r 40	65	58
Sulfuric acid	3,886	3,855	3,166
Talc, soapstone, pyrophyllite ---- metric tons	r 20,300	20,600	19,100
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	218	201	209
Coal:			
Anthracite	3,354	2,534	2,534
Bituminous	126,822	106,684	125,286
Other	1,900	1,000	858
Coke:			
Metallurgical	17,777	15,776	15,859
Gashouse	212	16	(2)
Breeze, all types	r 1,146	1,052	1,187
Fuel briquets, all grades	1,185	992	1,190
Gas:			
Manufactured [9] ---- million therms	r 1,018	526	NA
Natural ---- million cubic feet	1,018,400	1,230,039	1,208,180
Natural gas liquids ---- thousand 42-gallon barrels	2,698	3,059	3,240

See footnotes at end of table.

Table 1.—United Kingdom: Production of mineral commodities—Continued
(Thousand metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude thousand 42-gallon barrels	641	637	8,902
Refinery products:			
Gasoline:			
Aviation do	560	2,473	2,311
Motor do	126,210	123,473	118,541
Jet fuel do	38,920	33,905	28,809
Kerosine do	21,042	21,548	20,446
Distillate fuel oil do	207,790	206,205	174,000
Residual fuel oil do	280,021	266,669	217,953
Lubricants do	10,334	10,185	7,985
Other do	101,752	103,125	74,944
Refinery fuel and losses do	56,311	52,269	44,843
Total do	842,940	819,852	689,832

e Estimate. p Preliminary. r Revised. NA Not available.
1 Includes antimony content of antimonial lead and antimony compounds.
2 Less than ½ unit.
3 Includes wheels, centers, tires, axles, and semimanufactures for sale.
4 Lead refined from imported bullion.
5 Lead refined from scrap materials and domestic ores.
6 Year ending May 31 of that stated.
7 Excludes plaster.
8 Consists of bricks, retorts, molds, and other refractory products made from clays, silica, siliceous material, magnesite, alumina and chrome materials.
9 Gas made at gasworks plus purchased coke oven refinery gas.

TRADE

The United Kingdom was almost entirely dependent upon imported petroleum in 1975, but this dependence was expected to diminish and eventually disappear over the next decade as North Sea production increased. The bulk of crude came from the Middle East. In addition, the United Kingdom traditionally had a moderate net import deficit of refined products, which was filled by refineries on the continent.

Ores and metals were imported largely from present or former Commonwealth countries: Lead and zinc from Australia and Canada, copper from Zambia, iron ore from Canada, and manganese and chromite from the Republic of South Africa. Other supplies came from major producing areas, such as copper from Chile and iron ore from Sweden.

The United Kingdom's trade with the United States was important to both nations and included smaller amounts of the major metals and relatively large amounts of the minor metals.

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

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite and concentrate	519	248	NA.
Oxide and hydroxide	33,328	110,572	NA.
Metal including alloys:			
Scrap	3,455	13,033	West Germany 5,950.
Unwrought	85,328	86,901	Netherlands 16,640; West Germany 14,587; Italy 12,706.
Semimanufactures	53,925	86,270	West Germany 7,345; Ireland 6,631.
Antimony metal [1]	700	1,059	NA.
Arsenic trioxide, pentoxide, acids	(2)	2,471	NA.
Beryllium metal including alloys, all forms	11	1	NA.
Bismuth metal including alloys [1]	460	3,132	NA.
Cadmium metal including alloys [1]	133	468	NA.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Chromium:			
Chromite	10	4,450	NA.
Oxide and hydroxide value, thousands	$1,283	$910	NA.
Metal including alloys, all forms	2,400	2,738	NA.
Cobalt:			
Oxide and hydroxide	185	158	NA.
Metal including matte, speiss, etc.[1]	500	838	NA.
Columbium and tantalum metal including alloys, all forms, tantalum	11	33	NA.
Copper:			
Ore and concentrate	1,224	288	NA.
Metal including alloys:			
Scrap	10,778	29,954	Belgium-Luxembourg 10,694; West Germany 8,726.
Unwrought	110,666	72,081	Italy 19,141; West Germany 13,765.
Semimanufactures	132,010	115,835	Switzerland 17,735; Ireland 8,257; Sweden 7,518.
Gold, unworked or partly worked:			
Bullion, refined thousand troy ounces	17,290	17,829	NA.
Other do	108	2	NA.
Iron and steel:			
Ore and concentrate, except roasted pyrite	103	375	NA.
Metal:			
Scrap thousand tons	741	312	Belgium-Luxembourg 135; Spain 45; Netherlands 40.
Pig iron, ferroalloys, similar materials do	45	325	West Germany 12; Sweden 6; Norway 2.
Steel, primary forms do	221	224	United States 63; Italy 38; West Germany 25.
Semimanufactures:			
Bars, rods, angles, shapes, sections:			
Wire rod do	360	176	United States 68; West Germany 21.
Other bars and rods do	511	453	United States 105.
Angles, shapes, sections do	400	547	United States 86.
Universals, plates, sheets:			
Universals and heavy plates, uncoated do	415	252	United States 47; Argentina 31; Canada 30.
Medium plates and sheets, uncoated do	83	30	United States 9; Ireland 3.
Light plates and sheets, uncoated do	621	404	United States 68; Sweden 35; Spain 30.
Tinned plates and sheets do	352	216	Greece 12.
Other coated plates and sheets do	307	221	Norway 22.
Hoop and strip do	179	138	United States 13.
Rails and accessories do	145	190	France 40; Italy 11.
Wire do	123	216	United States 79; Canada 37.
Tubes, pipes, fittings do	583	767	Australia 118; Ireland 97.
Castings and forgings, rough do	56	62	United States 26; Sweden 16.
Total do	4,135	3,672	
Lead:			
Ore and concentrate	9,173	5,871	Belgium-Luxembourg 5,722.
Oxides	9,454	9,109	Ireland 3,390.
Metal including alloys:			
Scrap	7,422	24,892	NA.
Unwrought	147,481	138,779	West Germany 27,742; Netherlands 26,913; France 16,703.
Semimanufactures	2,828	2,641	NA.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Magnesium metal including alloys:			
Scrap	272	94	NA.
Unwrought	1,375	10,829	France 9,190.
Semimanufactures	343	418	NA.
Manganese:			
Ore and concentrate	3,520	138,302	NA.
Oxides	4,438	2,010	NA.
Mercury ---- 76-pound flasks	r 3,520	4,119	NA.
Molybdenum metal including alloys, all forms	118	138	Netherlands 64.
Nickel:			
Matte, speiss, similar materials	952	1,558	West Germany 513.
Metal including alloys:			
Scrap	2,379	4,237	Netherlands 1,043; West Germany 854; United States 576.
Unwrought	36,549	40,104	West Germany 11,193; France 5,458; United States 5,183.
Semimanufactures	14,456	26,689	France 3,072; United States 2,744; Italy 2,424.
Platinum-group metals and silver:			
Ore and concentrate value, thousands	--	$321	NA.
Waste and sweepings ---- do	$932	$6,193	NA.
Metal including alloys:			
Platinum group thousand troy ounces	2,143	868	United States 739.
Silver:			
Refined ---- do	88,297	70,355	NA.
Other ---- do	12,422	434	NA.
Tin:			
Ore and concentrate	456	1,944	NA.
Oxides	451	462	Brazil 100.
Metal including alloys:			
Scrap	51	628	NA.
Unwrought	18,736	58,114	Hungary 46,300.
Semimanufactures	612	1,006	Norway 177.
Titanium oxides	9,356	8,260	Ireland 765; Japan 754; Netherlands 702.
Tungsten:			
Ore and concentrate	729	1,038	United States 112; West Germany 88.
Metal including alloys, all forms	273	387	Netherlands 64.
Uranium and thorium metals including alloys, all forms ---- kilograms	600	13	NA.
Zinc:			
Ore and concentrate	6,809	14,009	Sweden 9,326.
Oxide and peroxide	9,724	15,301	France 3,018; Belgium-Luxembourg 1,309.
Metals including alloys:			
Scrap	2,356	4,634	NA.
Unwrought	26,665	12,686	Ireland 2,078; United States 2,053.
Semimanufactures	11,416	10,451	Denmark 710.
Other:			
Ore and concentrate:			
Of molybdenum, tantalum, titanium, vanadium, zirconium	3,250	(3)	Japan $624; West Germany $247.
Of base metals, n.e.s. value, thousands	$309	$260	NA.
Ash and residue containing nonferrous metals	39,425	72,772	Netherlands 35,698; Belgium-Luxembourg 10,367.
Oxides, hydroxides, peroxides of metals, n.e.s	(4)	44,642	Ireland 20,539.
Metals including alloys, all forms:			
Metalloids, n.e.s. value, thousands	$2,364	$4,500	Sweden $68.
Alkali, alkaline earth, rare-earth metals	341	194	NA.
Pyrophoric alloys	102	65	NA.
Base metals including alloys, all forms, n.e.s	2,390	9,629	United States 3,093; France 776.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	4,705	6,526	United States 902.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Abrasives, natural, n.e.s—Continued			
Dust and powder of precious and semiprecious stones value, thousands	$7,197	$6,593	Netherlands $1,420; Japan $1,151; United States $762.
Grinding and polishing wheels and stones	7,883	9,182	Sweden 1,848; West Germany 1,267; France 1,017.
Asbestos, crude and waste	2,826	4,698	NA.
Barite and witherite	2,135	4,848	NA.
Boric oxide and acid	173	145	NA.
Cement	1,506	1,060	United States 581; Ivory Coast 90; Canary Islands 64.
Chalk	45,137	58,843	NA.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s thousand tons	2,848	3,043	West Germany 486; Italy 469; Finland 391.
Products:			
Refractory (including nonclay brick) do	347	430	Australia 70; Sweden 38.
Nonrefractory do	91	90	United States 18; Canada 11.
Cryolite and chiolite	23	10	NA.
Diamond, all grades value, millions	$1,949	$1,333	Switzerland $398; Belgium-Luxembourg $371; United States $223.
Diatomite and other infusorial earth	3,080	(5)	NA.
Feldspar and fluorspar	88,655	90,793	Norway 25,633; Netherlands 24,781.
Fertilizer materials:			
Crude:			
Nitrogenous	37	379	NA.
Phosphatic	2,599	429	NA.
Potassic	90	24	NA.
Other	762	1,809	NA.
Manufactured:			
Nitrogenous thousand tons	(6)	131	Ireland 25; India 11.
Phosphatic	75,879	91,204	Ireland 39,616.
Potassic	1,832	9,826	NA.
Other including mixed	266,421	529,494	Ireland 150,130; West Germany 55,841.
Graphite, natural	1,815	21,804	NA.
Gypsum and plasters	14,712	14,924	NA.
Lime	38,368	42,063	Nigeria 6,865.
Magnesite	2,027	7,063	NA.
Mica:			
Crude including splittings and waste	5,559	2,096	NA.
Worked including agglomerated splittings	274	250	NA.
Pigments, mineral:			
Natural, crude	2,668	3,921	NA.
Iron oxides, processed	7,172	9,479	NA.
Precious and semiprecious stones, except diamond:			
Natural value, thousands	$43,806	$33,750	Switzerland $12,051; West Germany $4,043; France $3,910.
Manufactured do	$243	$257	NA.
Salt thousand tons	479	624	Nigeria 174; Sweden 167; Ireland 71.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	276,446	222,472	Australia 107,560.
Caustic potash, sodic and potassic peroxides	876	1,316	NA.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	12,502	32,311	West Germany 5,091.
Worked	5,381	6,874	NA.
Dolomite, chiefly refractory grade	21,192	12,447	Chile 7,317.
Gravel and crushed rock thousand tons	4,132	4,788	France 1,865; Netherlands 1,819.
Limestone (except dimension)	53,220	85,232	NA.
Quartz and quartzite	228	2,724	NA.
Sand, excluding metal bearing	74,969	120,427	Ireland 29,049.
Strontium minerals, celestite [1]	3,000	2,100	NA.
Sulfur:			
Elemental:			
Other than colloidal	1,830	6,023	NA.
Colloidal	597	458	NA.
Sulfur dioxide value	$34,331	$37,400	NA.
Sulfuric acid	68,294	200,597	Ireland 51,487.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Talc, steatite, soapstone, pyrophyllite	2,044	1,790	NA.
Other nonmetals, n.e.s.:			
Crude	517,817	601,003	Norway 242,457; Belgium-Luxembourg 182,222.
Slag, dross, similar waste, not metal bearing:			
From iron and steel manufacture	135,879	76,540	West Germany 68,665.
Slag and ash, n.e.s	1,771	4,378	NA.
Oxides and hydroxides of magnesium, strontium, barium	40,596	63,754	United States 12,269; West Germany 8,524; France 7,917.
Halogens, other than chlorine	1,843	2,100	NA.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	75,077	93,429	Ireland 12,540.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	8,420	3,181	NA.
Carbon black	48,415	49,412	Ireland 6,358.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	2,693	1,863	France 580; West Germany 365; Belgium-Luxembourg 363.
Briquets of anthracite and bituminous coal do	176	264	Norway 203.
Lignite and lignite briquets	202	24	NA.
Coke and semicoke thousand tons	586	1,704	Sweden 325; Norway 261; West Germany 162.
Hydrogen and rare gases	1,292	1,276	NA.
Peat including peat briquets and litter	1,083	1,821	NA.
Petroleum:			
Crude and partly refined:			
Crude thousand 42-gallon barrels	r 20,186	6,347	Ireland 3,471.
Partly refined do	r 572	624	Netherlands 489.
Refinery products:			
Gasoline (including natural) do	19,591	21,718	Netherlands 5,483; Ireland 5,160; Sweden 4,106.
Kerosine and jet fuel do	7,317	5,371	Ireland 1,457; Norway 1,070; Denmark 1,008.
Distillate fuel oil do	47,327	50,430	Sweden 12,384; Denmark 11,518; Netherlands 10,078.
Residual fuel oil do	37,291	23,250	Ireland 8,485; Denmark 4,555; Netherlands 1,818.
Lubricants do	5,656	5,634	Belgium-Luxembourg 631; Netherlands 540.
Other:			
Liquefied petroleum gas do	2,163	2,308	Ireland 742; Portugal 325.
Mineral jelly and wax do	110	220	NA.
Nonlubricating oils, n.e.s do	4,250	588	Republic of South Africa 98.
Bitumen and other residues and bituminous mixtures, n.e.s do	457	939	Ireland 545.
Pitch, pitch coke, petroleum coke do	1,110	1,205	Norway 457; France 209; Spain 132.
Total do	125,272	111,663	
Mineral tar, and other coal–, petroleum–, or gas–derived crude chemicals	(7)	206,062	Netherlands 80,086; West Germany 52,886; Norway 10,540.

r Revised. NA Not available.
[1] Source: Institute of Geological Sciences, (London). United Kingdom Statistics 1975. Her Majesty's Stationery Office, 1975.
[2] Value only reported at $549,000 in 1973.
[3] Value only reported at $2,174 in 1974.
[4] Value only reported at $21,430,000 in 1973.
[5] Value only reported at $306,409 in 1974.
[6] Value only reported at $7,720,000 in 1973.
[7] Value only reported at $9,895,000 in 1973.

Table 3.—United Kingdom: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate thousand tons	299	324	Ghana 223; Greece 55.
Oxide and hydroxide do	546	603	Jamaica 453.
Metal including alloys:			
Scrap do	21	22	NA.
Unwrought do	287	281	Norway 131; Canada 67.
Semimanufactures do	94	132	United States 27; Switzerland 20; West Germany 18.
Arsenic trioxide, pentoxide, acids	[1] 6,300	5,934	NA.
Beryllium metal including alloys, all forms	13	(2)	Mainly from United States.
Bismuth metal including alloys, all forms [1]	550	3,241	NA.
Cadmium metal including alloys, all forms [1]	1,338	4,974	NA.
Chromium:			
Chromite thousand tons	199	151	Philippines 64; Republic of South Africa 45.
Oxide and hydroxide value, thousands	$709	$508	West Germany $172.
Cobalt:			
Oxide and hydroxide	808	1,065	Canada 848.
Metal including alloys, all forms [1]	1,900	8,603	NA.
Columbium and tantalum, tantalum metal including alloys, all forms	67	53	United States 30.
Copper:			
Ore and concentrate	204	46	NA.
Matte	15	1,570	NA.
Metal including alloys:			
Scrap	23,712	26,132	United States 4,342; Chile 4,014.
Unwrought	466,591	458,658	Canada 95,310; Chile 86,796; Zambia 69,860.
Semimanufactures	40,284	44,120	West Germany 12,157.
Gold, unworked or partly worked:			
Bullion:			
Refined thousand troy ounces	21,610	17,829	NA.
Unrefined do	371	311	NA.
Other do	114	2	NA.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	22,918	19,675	Canada 4,292; Sweden 3,924; Brazil 3,141.
Roasted pyrite do	237	617	Sweden 281.
Metal:			
Scrap do	222	140	United States 124.
Pig iron including cast iron, sponge, powder, shot do	148	143	Norway 41; Finland 27; Sweden 23.
Ferroalloys:			
Ferromanganese do	79	124	Norway 75; Republic of South Africa 38.
Other do	244	198	NA.
Steel, primary forms do	263	447	Netherlands 81; West Germany 60; Japan 58.
Semimanufactures:			
Bars, rods, angles, shapes, sections:			
Wire rods do	103	114	Sweden 19; Belgium-Luxembourg 18; France 14.
Other bars and rods do	501	450	Netherlands 87; Sweden 70; West Germany 58.
Angles, shapes, sections do	132	364	Belgium-Luxembourg 47.
Universals, plates, sheets:			
Heavy and medium plates and sheets, uncoated do	381	1,325	Poland 952; West Germany 288.
Light plates and sheets, uncoated do	774	925	Netherlands 319; West Germany 265; Belgium-Luxembourg 202.
Tinned plates and sheets do	40	481	Netherlands 221.
Other coated plates and sheets do	112	145	Belgium-Luxembourg 44; West Germany 33; Netherlands 19.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Semimanufactures—Continued			
Hoop and strip thousand tons	76	173	Belgium-Luxembourg 67; West Germany 40; United States 21.
Rails and accessories do	1	1	NA.
Wire do	30	31	Sweden 6; Belgium-Luxembourg 4.
Tubes, pipes, fittings do	407	772	West Germany 233; Japan 141.
Castings and forgings, rough do	10	17	West Germany 3.
Total do	2,567	4,798	
Lead:			
Ore and concentrate do	39	55	Peru 14.
Oxides	697	550	NA.
Metal including alloys:			
Scrap	2,630	3,709	NA.
Unwrought thousand tons	216	217	Australia 167; Canada 32.
Semimanufactures	1,994	1,291	Ireland 824; Netherlands 246.
Magnesium metal including alloys:			
Scrap	445	934	NA.
Unwrought	6,194	7,988	Norway 3,049; United States 2,186; Canada 1,916.
Semimanufactures	102	163	NA.
Manganese:			
Ore and concentrate thousand tons	588	388	Republic of South Africa 134; Brazil 109.
Oxides	5,112	5,635	Japan 4,884.
Metal [1]	4,002	1,610	NA.
Mercury 76-pound flasks	21,616	24,076	Spain 5,541; Netherlands 4,583.
Molybdenum:			
Ore and concentrate	11,234	10,897	Netherlands 3,779; United States 2,780; Canada 1,364.
Metal including alloys, all forms	163	189	Austria 147.
Nickel:			
Matte, speiss, similar materials	48,264	49,870	Canada 48,698.
Metal including alloys:			
Scrap	4,822	6,861	United States 983; Netherlands 557.
Unwrought	23,924	24,858	Canada 15,988; Norway 3,536.
Semimanufactures	2,743	6,659	United States 4,043; West Germany 1,102.
Platinum-group metals and silver:			
Ore and concentrate value, thousands	$116,033	$105,971	NA.
Waste and sweepings do	$61,428	$118,879	United States $33,684; United Arab Emirates $18,958.
Metals including alloys:			
Platinum group thousand troy ounces	260	96	NA.
Silver do	r 17,696	240,297	NA.
Selenium, elemental [1]	227	3,472	Canada 1,156.
Silicon, elemental [1]	22,431	8,825	Norway 5,496.
Tin:			
Ore and concentrate	50,430	40,390	Peru 13,487; Bolivia 12,220.
Oxides	(2)	10	NA.
Metal including alloys:			
Scrap	2,537	1,692	United States 293; Netherlands 285; West Germany 165.
Unwrought and semimanufactures	6,194	8,036	Malaysia 3,145; Nigeria 2,724.
Titanium:			
Ore and concentrate [1] thousand tons	408	11	Australia 10.
Oxides do	5	4	West Germany 2.
Metal including alloys, all forms [1] do	7	9	NA.
Tungsten:			
Ore and concentrate	8,762	4,009	Portugal 824; Netherlands 785; Thailand 490.
Metal including alloys, all forms	60	119	United States 49.
Uranium and thorium:			
Ore and concentrate	404	752	NA.
Metal including alloys, all forms	--	9	NA.
Zinc:			
Ore and concentrate thousand tons	r 144	206	Australia 74; Peru 63; Ireland 22.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Zinc—Continued			
Oxide and peroxide	929	3,534	NA.
Metal including alloys:			
Scrap and blue powder	2,874	3,263	NA.
Unwrought ... thousand tons	226	206	Netherlands 47; Finland 43; Canada 30.
Semimanufactures	2,650	4,177	NA.
Zirconium: [1]			
Ore and concentrate	40,600	2,543	Australia 2,058.
Metal including alloys, all forms	100	648	NA.
Other:			
Ore and concentrate of tantalum and vanadium	2,686	--	
Ash and residue containing nonferrous metals	78,718	76,001	Canada 17,201; United States 16,922.
Oxides, hydroxides, peroxides of metals, n.e.s	([3])	288,950	Netherlands 118,641; Trinidad and Tobago 80,118.
Metal including alloys, all forms:			
Metalloids, n.e.s. value, thousands	$31,996	$50,483	Canada $28,591.
Alkali, alkaline earths, and rare-earth metals	3,806	1,091	NA.
Pyrophoric alloys	31	21	NA.
Base metals including alloys, all forms, n.e.s	8,876	14,770	United States 2,481; Republic of South Africa 2,242.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc ... thousand tons	223	106	Italy 52; Turkey 24.
Dust and powder of precious and semiprecious stones value, thousands	$1,346	$8,067	NA.
Grinding and polishing wheels and stones	2,866	2,665	Netherlands 428; Italy 356; West Germany 342.
Asbestos ... thousand tons	198	153	Canada 108; Swaziland 16; Republic of South Africa 16.
Barite and witherite ... do	89	54	Morocco 26; Ireland 8.
Boron materials:			
Borax	10,600	--	
Oxide and acid	8,015	8,000	NA.
Bromine	1,471	2,511	NA.
Cement ... thousand tons	165	201	Ireland 123.
Chalk	359	1,069	NA.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s ... thousand tons	152	174	United States 98; Republic of South Africa 25; France 15.
Products:			
Refractory (including nonclay brick)	88,804	73,066	Denmark 14,680; Ireland 13,614; Austria 13,515.
Nonrefractory	71,312	36,541	Italy 7,973; West Germany 6,533; Ireland 3,748.
Cryolite and chiolite	4,110	1,960	Denmark 1,940.
Diamond, all grades ... value, millions	$1,780	$1,328	NA.
Diatomite and other infusorial earth	13,948	--	
Feldspar and fluorspar thousand tons	176	197	Norway 138; Finland 26.
Fertilizer materials:			
Crude:			
Nitrogenous ... do	11	10	Chile 6.
Phosphatic ... do	1,964	2,042	Morocco 1,522; Senegal 265; Tunisia 131.
Potassic ... do	85	26	East Germany 22.
Manufactured:			
Nitrogenous ... thousand tons	345	428	NA.
Phosphatic:			
Thomas (basic) slag	59,394	53,178	Belgium-Luxembourg 53,178.
Other	36,320	21,678	France 9,757; Portugal 2,865.
Potassic ... thousand tons	802	846	East Germany 276; West Germany 179; U.S.S.R. 104.
Other including mixed ... do	291	211	Netherlands 91; Belgium-Luxembourg 58; Ireland 29.

See footnotes at end of table.

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Graphite, natural	13,644	15,962	Malagasy Republic 7,643; Norway 2,379.
Gypsum and plasters _ thousand tons	211	122	Ireland 86.
Iodine	1,076	2,516	Israel 1,235; Japan 822.
Lime	1,163	1,232	NA.
Magnesite thousand tons	108	122	Spain 41; Greece 26.
Mica:			
Crude including splittings and waste	10,336	8,011	Republic of South Africa 1,646; India 1,349.
Worked including agglomerated splittings	372	514	Belgium-Luxembourg 358.
Pigments, mineral:			
Natural, crude	6,351	6,711	NA.
Iron oxides, processed	24,672	25,856	West Germany 20,515.
Precious and semiprecious stones, except diamond:			
Natural value, thousands	$58,181	$45,167	Switzerland $12,906.
Manufactured do	$959	$862	NA.
Pyrite (gross weight) thousand tons	45	35	NA.
Salt and brine do	22	24	NA.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	1,441	11,882	NA.
Caustic potash, sodic and potassic peroxides	3,576	4,194	NA.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	17,257	26,240	Italy 25,450.
Slate	151	428	NA.
Other	14,513	19,347	Sweden 4,491; Republic of South Africa 3,005.
Worked:			
Slate	7,548	2,202	NA.
Paving and flagstone	20,937	17,940	Portugal 15,441.
Other	12,944	267,031	Italy 258,848.
Dolomite	34,171	47,735	Spain 35,735; Norway 10,344.
Gravel and crushed rock thousand tons	252	239	Ireland 128; Norway 38; Italy 32.
Limestone (except dimension)	8,281	5,680	NA.
Quartz and quartzite	8,391	6,708	NA.
Sand, excluding metal bearing thousand tons	208	177	Belgium-Luxembourg 148.
Sulfur:			
Elemental:			
Other than colloidal	1,269	1,379	Poland 493; France 412; Mexico 149.
Colloidal	5,231	432	NA.
Sulfur dioxide value	$31,879	$2,339	NA.
Sulfuric acid	163	76	NA.
Talc, steatite, soapstone, pyrophyllite	63,283	61,846	Norway 14,846; France 13,245; People's Republic of China 10,252.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet	14,059	16,205	Spain 15,619.
Other thousand tons	397	377	Italy 97; United States 48; Greece 37.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	19,988	56,763	NA.
Slag and ash, n.e.s	16,972	11,649	Netherlands 6,440.
Oxides and hydroxides of magnesium, strontium, barium	12,611	26,070	Italy 17,985.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	40,797	65,790	Belgium-Luxembourg 40,745; Ireland 8,520.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	38,435	35,223	Trinidad and Tobago 22,418.
Carbon black and gas carbon:			
Carbon black	12,617	9,946	United States 3,705; Netherlands 1,390; West Germany 1,279.
Gas carbon	--	4	NA.

See footnote at end of table.

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

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coal and briquets:			
Anthracite and bituminous thousand tons	1,676	3,546	United States 1,676; Australia 999; Poland 692.
Briquets of anthracite and bituminous do	195	168	France 90; West Germany 51.
Lignite and lignite briquets	20	1,708	NA.
Coke and semicoke thousand tons	54	4	Belgium-Luxembourg 1; West Germany 1.
Hydrogen and rare gases	1,777	4,016	NA.
Peat including peat briquets and litter thousand tons	122	126	Ireland 115.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	849,952	782,303	Saudi Arabia 245,434; Kuwait 118,855; Iran 100,049.
Refinery products:			
Gasoline (including natural) do	65,530	50,637	Netherlands 10,534; Italy 8,204.
Kerosine and jet fuel do	12,646	8,231	Netherlands 4,348; Italy 1,913.
Distillate fuel oil do	16,858	10,061	Netherlands 3,128.
Residual fuel oil do	50,099	39,703	Netherlands 20,823.
Lubricants do	3,972	3,717	United States 726; Netherlands 726.
Other:			
Liquefied petroleum gas do	10,641	8,271	Algeria 5,507; Sweden 1,247.
Mineral jelly and wax do	493	444	Venezuela 75.
Nonlubricating oils, n.e.s do	715	201	West Germany 35; Belgium-Luxembourg 21.
Bitumen and other residues and bituminous mixtures, n.e.s do	1,504	1,818	Netherlands 558; Belgium-Luxembourg 553.
Pitch, pitch coke, petroleum coke do	1,797	1,082	United States 651; Netherlands 246.
Total do	164,255	124,165	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 24,718	250,493	Netherlands 98,450; Sweden 57,165.

r Revised. NA Not available.

[1] Source: Institute of Geological Sciences, London. United Kingdom Mineral Statistics 1974. Her Majesty's Stationery Office, 1974, 144 pp.

[2] Less than ½ unit.

[3] Value only reported at $28,421,000 in 1973.

COMMODITY REVIEW

METALS

Aluminum.—Reduced aluminum demand during the year caused all the United Kingdom plants to operate below capacity.

British Insulated Callenders Cables, Ltd. sold its 19% interest in Anglesey Aluminium Ltd. late in 1975 to one of the remaining shareholders, Kaiser Aluminum & Chemical Corp., whose share thus increased from 34% to 66⅔%; the share of Rio Tinto Zinc Corp., Ltd. was cut from 47% to 33⅓%. Financial arrangements connected with the sale took account of a large operating deficit in 1975; Anglesey had been hampered by labor and technical problems, and Kaiser intended to bring new technical and managerial talent to bear.

There are no economic deposits of bauxite in the United Kingdom. Three recently constructed large aluminum smelters and two older, smaller plants formed the United Kingdom's aluminum industry. The large plants were the Lynemouth, Northumberland plant (capacity 120,000 tons per year) of Alcan (U.K.) Ltd.; the Holyhead, Anglesey Island, Wales plant (100,000 tons per year) of Anglesey Aluminium; and the Invergordon, Scotland plant (100,000 tons per year) of the British Aluminium Co., Ltd. British Aluminium also operated the two smaller plants at Kinlochleven, Scotland (10,000 tons per year) and Lochaber (Fort William), Scotland (30,000 tons per year).

Copper.—The only mine production of copper in 1975 was copper-zinc-silver concentrates produced by the Wheal Jane tin mine in Cornwall; these were shipped to Boliden A.B. in Sweden. There was some minor activity in exploration of other copper properties, but no results were announced.

No primary copper smelters operated in the United Kingdom during 1975. There was, however, a significant capacity for refining scrap and imported blister, amounting to about 279,000 tons per year. Some 80% or 90% of this capacity is at the two plants of British Copper Refiners Ltd. at Widnes and Prescott, both outside Liverpool, and at the plant of IMI Refiners Ltd. at Walsall, near Birmingham.

Iron and Steel.—The nationalized British Steel Corp. (BSC) made a profit before taxes of £89 million in the year to March 1975, but experienced an estimated loss of £250 million[3] in the succeeding 12 months, attributed to strikes, economic recession, rising costs, and price cuts. The industry operated at 60% of capacity in the latter half of the 1975 financial year. Basic to the industry's problems was low productivity, which did not exceed 150 tons of steel per year per employee and which was rooted in poor labor-management relations and obsolete plants.

Domestic production of iron ore in the United Kingdom has declined steadily from a post-World War II high of 17.4 million tons in 1960 to less than 5 million tons in 1975. The small Llanharry underground mine, which was the last iron mine in Wales, closed in July for economic reasons.

About a dozen mines continued to operate in England. Five were in the Scunthorpe, Lincolnshire area (Frodingham Field), including one underground mine (Scanton); these were operated by BSC's General Steels Division. The rest included opencast mines operated by BSC's Tubes Division in the general area of Corby and Kettering, east of Birmingham (Northampton Sand Field), and the Beckermet underground mine in Cumberland. All together, these mines provided less than a quarter of the ore (gross weight) used in the United Kingdom's blast furnaces. Virtually all domestic ore, which was a low-iron, high-lime type, was used, blended with foreign ores, at two steel plants near Scunthorpe.

BSC, which produced 90% of the United Kingdom's steel, continued with its investment strategy based on increasing BSC steel capacity to 36 million or perhaps 38 million tons per year by the early 1980's, at a cost estimated at £4.5 billion at 1975 prices. The major project underway in 1975 was the Redcar development near Lackenby, South Teeside, which included the first 10,000-ton-per-day blast furnace in the United Kingdom, coke ovens, and sintering and pelletizing facilities, and which was to cost £452 million with ancillary facilities. BSC's investment

[3] The value of the pound sterling (£) declined from about US$2.35 on Jan. 1, 1975, to US$2.02 on Dec. 31, 1975.

strategy was concentrated on the five "heritage" steelmaking sites taken over from private industry at the time of nationalization almost a decade before. These were the integrated plants at Port Talbot and Llanwern, Wales; the Appleby Frodingham plant (Anchor project) at Scunthorpe, Lincolnshire; the Lackenby and nearby plants at South Teeside, Yorkshire; and the Ravenscraig plant at Motherwell southeast of Glasgow, Scotland. All these plants are well sited to utilize economically the overseas ore on which the industry will increasingly depend.

A sixth major steelmaking area was foreseen when a contract to build a Midrex direct-reduction unit at Hunterston, Scotland, on the coast southwest of Glasgow, was awarded in 1975 to Korf Engineering GmbH of Dusseldorf. The two modules to be constructed were to have a total capacity of 800,000 tons per year of reduced iron, chiefly for the Ravenscraig plant. This was to be the first direct-reduction plant in the United Kingdom. A decision was also made to erect a 250,000-ton-per-year electric arc plant and associated primary mill near Hunterston. Plans were also under study for the development of an integrated steel mill in the area using imported ore, and probably imported coal, to produce 5 million to 6 million tons of steel per year by 1985 using blast furnaces and basic oxygen furnaces. Hunterston was also the site of the ongoing construction of a deepwater port capable of handling 350,000-ton ore carriers.

Port Talbot, a recently constructed port, capable of unloading 100,000-ton ore carriers, was to be deepened to handle 150,000-ton vessels and eventually those of 250,000 tons. Ore for Llanwern is unloaded here, replacing Newport, and railed from Port Talbot to Llanwern. Dredging was planned at Immingham, the port for Scunthorpe; at Redcar port capacity was increased to permit unloading of 150,000-ton ships.

Lead and Zinc.—A small production of lead and zinc was obtained as a byproduct of mining for other minerals. In the Peak District National Park, southeast of Manchester, Laporte Industries Ltd. produced lead-zinc concentrates in connection with its fluorspar operations. The Wheal Jane tin mine in Cornwall also produced copper-zinc-silver concentrates from its ore. Some production has also been reported from County Flint in Wales and from County Durham.

Two primary smelters or refineries operated during the year. At Avonmouth, a suburb of Bristol, Commonwealth Smelting Ltd., a subsidiary of AM & S Europe Ltd. and thus of Rio Tinto Zinc Corp. Ltd., smelted lead-zinc ores using the Imperial smelting process. At Northfleet, near Gravesend, east of London, the Britannia Lead Co. Ltd., a subsidiary of MIM Holdings Ltd., refined lead from the Mt. Isa mine in Australia.

Nickel.—Production of refined nickel increased during 1975, counter to the trend in production of most other metals.

Nickel was refined at the carbonyl refinery of International Nickel Ltd. at Clydach, near Swansea, Wales, from nickel matte produced at Sudbury, Canada. Capacity of the plant was a nominal 40,000 tons of nickel pellets per year.

Johnson Matthey & Co. also treated copper-nickel matte from Rustenburg Platinum Mines, Republic of South Africa, in order to separate platinum-group metals. Johnson Matthey operated blast furnaces and reverberatory furnaces at Brimsdown, near Enfield, Middlesex, and a wet-process plant at Royston, Hertford, to purify the platinum-group metals.

Tin.—Lower prices for tin caused difficulties for United Kingdom mines in 1975; one mine was reported operating at a loss, but prospects for 1976 were favorable.

Two net tin mining operations were in the planning and development stages. The Mt. Wellington mine, southwest of Truro and next to the Wheal Jane mine, was being developed at a cost of £5.3 million by Cornwall Tin and Mining Corp., Ltd., controlled by Prado Exploration Ltd. of Toronto, Canada, and Excomm of Bermuda. The second prospective operation was the dredging for tin off the north coast of Cornwall, near St. Agnes, planned by Marine Mining (Cornwall) Ltd., a subsidiary of Marine Mining Corp. of New Jersey. Approval of plans by the Ministry of Fisheries was awaited; this was required because of possible damage to the local fishing industry.

The tin mining industry was limited in 1975 to three major operations in Cornwall, each producing in the range of 800 to 1,500 tons of tin in concentrates per year; the total amounted to less than a quarter of United Kingdom domestic consumption. Geevor Tin Mines Ltd. operated the Geevor mine near the north coast, northwest of Penzance, and was preparing to sink a subincline shaft to follow the Geevor lodes seaward and to reach the lower levels of the adjacent Levant mine, which was not in operation. St. Piran Ltd. operated the South Crofty and Pendarves mines between Camborne and Pedrate; and Wheal Jane Ltd., owned by Consolidated Gold Fields, operated the Wheal Jane mine southwest of Truro.

With the closure of the Williams, Harvey & Co. Ltd. tin smelter in 1973, the only remaining tin smelter in the United Kingdom was the Capper Pass & Son Ltd. plant at North Ferriby, Yorkshire, west of Hull, a subsidiary of Rio Tinto Zinc. The smelter treated a variety of complex ores, but tin was the major product.

NONMETALS

Fertilizer Materials.—*Nitrogen.*—Imperial Chemical Industries Ltd. (ICI) was making satisfactory progress on construction of a new ammonia plant at Billingham, Cleveland, to produce 360,000 tons per year; completion was expected by the end of 1976.

Fixed-nitrogen plants operating in the United Kingdom in 1975 were as follows:

Company and location	Ammonia capacity (thousand tons per year)
ICI:	
Billingham, North Teeside	258
Do	258
Do	258
Immingham, South Humberside	172
Heysham, Lancastershire	127
Do	80
Redwick, Severnside	163
Nitrogas fertilizers: Flexborough (Scunthorpe), Lincolnshire	34
Shellstar Ltd. (UKF): Ince Marshes, near Liverpool	300
Total	1,650

Planning and paperwork for a scheduled new ammonia plant at Peterhead, northeast Scotland, to cost £50 million, also went ahead during the year. The plant would produce 300,000 to 350,000 tons per year and was to be built and operated by Scanitro, a company controlled by two Scandinavian fertilizer producers, Norsk Hydro and Supra A.B.

Shellstar Ltd., a subsidiary of Unie Van Kunstmestfabriken (UKF) of the Netherlands, also applied for planning permission to build a 330,000-ton-per-year plant near its existing facilities at Ince Marshes.

Potash.—The Boulby mine and plant of Cleveland Potash Co., near Loftus on the north coast of Yorkshire, started regular production and was attempting to reach a production rate of 1 million tons per year of 60% K_2O product. Delays were still being encountered because of the aftereffects of severe water inflows during shaft sinking and the difficulty of developing sufficient working faces.

Applications to extend planning permission for two additional potash mines by Whitby Potash Ltd. (Shell International) and Yorkshire Potash Ltd. (Rio Tinto Zinc) were turned down at yearend for environmental reasons. All three mining areas (including Boulby) are located within the North Yorkshire Moors National Park. It was suggested that a combined operation might be approved, and the companies were expected to appeal the decision.

MINERAL FUELS

The United Kingdom derived about half of its energy from net imported fuels, almost all of which was crude petroleum and refinery products. Coal continued its decline, both in actual consumption and in its participation in overall energy supplies, which was about 30% during the year. Natural gas from the United Kingdom's sector of the North Sea made a useful contribution, reaching about 14% of total energy consumed in 1975.

The prospect of self-sufficiency in energy within a decade was held out by the first production of petroleum from the North Sea.

Table 4 shows energy balances for 1973 and 1974 for the United Kingdom. It includes the relatively high percentage (4% to 5%) of energy from the United Kingdom's established and growing nuclear energy industry.

Table 4.—United Kingdom: Supply and apparent consumption of energy-producing materials in 1973 and 1974
(Million tons of standard coal equivalent) [1]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Hydro-electric and nuclear power
1973:					
Production	174.5	131.5	0.6	38.4	4.0
Imports	196.8	1.9	193.9	1.0	(4)
Exports	38.3	[2]11.7	[2]26.6	--	(4)
Apparent consumption	333.0	121.7	[3]167.9	39.4	4.0
1974:					
Production	161.7	109.9	.7	46.4	4.7
Imports	190.2	3.7	185.7	.8	(4)
Exports	31.1	[2]12.7	[2]18.4	--	(4)
Apparent consumption	320.8	100.9	[3]168.0	47.2	4.7

[1] 1 ton standard coal equivalent (SCE) = 7,000,000 kilocalories.
[2] Includes bunkers.
[3] Includes refinery fuel and losses.
[4] Less than ½ unit.

Coal.—Activity in the United Kingdom's coal industry centered on the development of the important new Selby coalfied between the cities of Selby and York in Yorkshire. By mid-1975 a total of 35 drill holes had been completed, spaced 3 to 4 kilometers apart. They first (by 1967) revealed that the Barnsley seam, traditionally the best of all the Yorkshire coal seams, did not end south of Selby but that the boundary actually turned north some miles west of Selby and afterwards turned eastward near York, thus encompassing the area between Selby and York. It was furthermore discovered that the Selby seam, which split into several seams south of Selby, recombined into one thick, high-quality seam at workable depths in this area. An average ash content of 5% and a sulfur content of 1.3% were indicated, with the seam varying from 3 meters thick at a depth of 300 meters in the western extremity to 2 meters thick in the east, near the River Derwent, at a depth of 1,100 meters. Indicated recoverable reserves in the Barnsley seam alone were of the order of 250 million tons, allowing for pillars for surface support, out of a total of some 600 million tons. Selby was expected to produce 10 million tons per year by 1985–86, and the estimated development cost was £300 million. Development was to start in October 1976 if problems of surface subsidence, including possible relocation of the London-Edinburgh rail line, were solved.

Selby was the major project to be undertaken under the 10-year, £600 million Plan for Coal announced in 1973, which was based on an intensive exploration program initiated the year before. This plan was formulated by the National Coal Board (NCB), the Government agency that operates the nationalized coal mines and related facilities, to arrest and eventually reverse the decline in the rate of the United Kingdom's coal production, which totaled almost 100 million tons per year in the period from 1955 to 1975. This was to be done: (1) By investment in collieries with good reserves; (2) by providing access to new reserves in certain existing collieries; and (3) by constructing new collieries in areas where exploration was successful. Without new investment, production potential, which was about 125 million tons in 1975 but which had fluctuated because of labor troubles, was expected to decline by about 40 million tons between 1975 and 1985. The Plan for Coal had the aim of bringing in new production sufficient to maintain the total at or near 120 million tons per year. Of the new 40 million tons, 20 million would come from existing mines, 10 million from Selby, and 10 million from smaller new mines in the Vale of Belvoir, in the Vale of Greet, and at North Newark (all in Nottinghamshire, northeast of Nottingham) and at Park in Staffordshire. Production was also planned at two still smaller mines at Betws Drift near Ammanford, South Wales, and at Royston, Yorkshire. Another potential area for development was also under consideration, west of

Barnsley, Yorkshire. In 1974–75 an increase in the NCB goal to 142 million tons by 1985, at a cost of £1,400 million, was recommended, and an ultimate production of 200 million tons was envisioned by the year 2000 after North Sea oil and gas production reached its peak. This massive development would entail some 80 separate major projects.

The coalfields of the United Kingdom, which supported 241 operating collieries at the end of the 1975–76 financial year, were concentrated in four main areas: Southern Scotland, roughly around Edinburgh and Glasgow; Durham in the northeast; the Midlands, from Birmingham to York, which produced about 68% of total output in 1975–76; and South Wales. The two belts of major exploration activity were located in the Midlands; the first extended north-south from Selby to the Vale of Belvoir in Nottinghamshire, and the second extended northwest to southeast through the cities of Birmingham and Coventry.

The total amount of coal existing beneath the land area of the United Kingdom, within technical limits on depth and seam thickness, was reported to be about 100,000 million tons in known coalfields, with the probability of a further 60,000 million tons in coalfields not proved but believed to exist by geological inference. The total technically recoverable reserve was probably of the order of 45,000 million tons. This contrasts with the 3,800 million tons of operating reserves accessible to existing collieries and capable of being won with existing technology at current costs and prices, and with a further 1,200 million tons available to new collieries, including Selby, still at the planning stage.[4]

Natural Gas.—Preliminary agreement was reached between Norway and the United Kingdom on rules for management of the Frigg Field, which straddles the mutual sector boundary in the North Sea. Division of the gas was to be dealt with on the basis of a forthcoming recommendation from a United States firm of consultants.

One new gasfield came into production in 1975; this was the Rough Field in the southern basin.

Natural gas provided 97% of total United Kingdom gas supplies in 1975. All of this came from the gasfields of the southern basin of the North Sea, between 53° and 54° north latitude.

Gas reserves in discoveries made up to December 31, 1975, in the United Kingdom sector of the North Sea were estimated to lie within the range of 800 billion to 1,400 billion cubic meters (29 trillion cubic feet). Proven reserves were 815 billion cubic meters, and the total, including both proven and possible reserves, consisted of 711 billion cubic meters in the southern basin and 719 billion cubic meters in the northern basin, where the gas is associated with oil. Drilling from fixed platforms in the gasfields of the southern basin continued to decrease as development work approached completion.[5] United Kingdom reserves were second in Europe only to the Netherlands' onshore gasfields.

The search for hydrocarbons in the North Sea began after the discovery of the onshore Groningen Field in the Netherlands in 1959. A broad belt of gasfields was subsequently located off the east coast of the United Kingdom. The major producing fields in 1975 were West Sole, Leman Bank, Hewett, Indefatigable, and Viking; in addition, the Rough Field went on production during the year. All gas was sold by the producers to the British Gas Corp. which had a policy of gas conservation, giving priority to premium markets.

Petroleum.—The first oil from the United Kingdom sector of the North Sea, from the small Argyll Field, was landed by tanker at the Thames estuary in June, following 6 years of exploration and development. In November the first oil from a major field, the BP Forties Field, was brought ashore by pipeline at Cruden Bay, north of Aberdeen. Total production from these two fields was over a million tons in 1975. Production from the Ekofisk Field in the Norwegian sector also began to be landed by pipeline to the Teeside area in October.

The 1976 "Brown Book"[6] estimated the United Kingdom's proven recoverable oil

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[4] National Coal Board. Report and Accounts 1975–76. P. 26.

[5] Secretary of State for Energy. Development of the Oil and Gas Resources of the United Kingdom, 1976–a report to Parliament. Her Majesty's Stationery Office, London, 1976, 126 pp.

[6] Work cited in footnote 5.

reserves in 1975 at 1,350 million tons; probable reserves were set at 960 million tons, and possible reserves at 880 million tons. All of these figures related to known fields. Ultimate potentially recoverable reserves from all designated areas of the United Kingdom Continental Shelf, including both licensed and as-yet-unlicensed areas, could be as high as 4,500 million tons.

Exploration and drilling activity reached a new peak in 1975; a record 115 exploration and appraisal wells were drilled, and 24 significant new oil (and 4 gas and condensate) discoveries were made, almost doubling the number of oil discoveries on the United Kingdom Shelf. The first seven developmental wells were drilled on North Sea oilfields during the year, and a further eight platforms were installed, bringing the total number in place (including one gas platform in the Frigg Field) to 11.

Onshore exploratory wells were drilled in Dorset and in the East Midlands. Some oil was produced in the Wytch Farm in Dorset and in the Beckingham, Axholme, Gainsborough, Coringham, and Torksey Fields; Beckingham was the major producer.

Negotiations continued on the division of the Continental Shelf with neighboring countries. Talks were in progress with the Irish Government and were shortly to begin with the Norwegian Government to settle the boundary north of the 62d parallel. The question of the United Kingdom-French boundary was before an international tribunal.

Seven fields under development in the United Kingdom sector in 1975 were scheduled to come into production by yearend 1976, and seven additional fields were targeted for 1977 production; all but Claymore were fairly close to the center of the North Sea. These are listed in table 5.

Table 5.—North Sea oilfields in the United Kingdom sector

Field	Approximate latitude °N	Approximate API gravity (degrees)	Startup date	Licensees (percent)
Argyll	56.2	30	1975	Hamilton Oil and Gas Ltd. (36), Rio Tinto Zinc (25), Texaco (24).
Auk	56.4	39	1976	Shell (50), Esso (50).
Montrose	57.4	39	1976	Amoco (30.77), British Gas Corp. (30.77), Amerach (23.08), Texas Eastern UK Ltd. (15.38).
Forties	57.8	37	1976	BP (100).
Piper	58.4	30	1975	Occidental International Oil (36.5), J. Paul Getty (23.5), Allied Chemical (20), Thomson Scottish Petroleum Ltd. (20).
Beryl	59.6	38	1975	Mobil (50), Amerada (20), Texas Eastern (20).
Brent	61.4	35	1975	Shell (50), Esso (50).
Claymore	58.4	30	1977	Occidental (36.5), Getty (23.5), Allied Chemical (20), Thomson Scottish (20).
Dunlin	61	36	1977	Shell (50), Esso (50).
Thistle	61	37	1977	Burmah Oil North Sea Ltd. (24), Deminex (42.5), Santa Fe (UK) Ltd. (22.5).
Ninian	61	35	1977	Chevron (24), Burmah (30), ICI (26).
Heather	61	35	1977	Unocal (31.25), Skelly Oil Exploration (UK) Limited (31.25), Tenneco (31.25).
Cormorant	61	36	1977	Shell (50), Esso (50).
U.K. Statfjord	61	38	1977	Conoco (33 1/3), Gulf (33 1/3), BNOC (33 1/3).

In addition to the two pipelines completed during the year, from Ekofisk to Teeside and from Forties to Cruden Bay, lines were under construction in 1975 from Piper and Claymore to Flotta, Orkney Islands, and from Ninian and the Brent System to Sullom Voe, Shetland Islands. During the 1975 pipelaying season, 392 miles of pipeline was laid in the United Kingdom sector of the North Sea.

The total throughput capacity of petroleum refineries in the United Kingdom was approximately 2.95 million barrels in 1975. Table 6 provides details of this capacity by individual refinery.

Table 6.—United Kingdom petroleum refineries, 1975

Company	Location	Approximate throughput capacity (barrels per calendar day)
Amoco U.K. Ltd	Milford Haven, Wales	80,000
Berry Wiggens & Co., Ltd	Kingsnorth, Kent	2,000
BP Ltd	Isle of Grain, Kent	229,000
Do	Llandarey, Wales	175,750
Do	Grangemouth, Scotland	186,200
Do	Belfast, North Ireland	32,300
Burmah-Castrol Co	Ellesmere Port, Chester	22,000
Conoco Ltd	South Killingholme, Lincoln	87,500
Esso Petroleum Co. Ltd	Fawley, Hampshire	348,000
Do	Milford Haven, Wales	310,700
Gulf Oil Refining Ltd	do	103,000
Lindsey Oil Refinery Ltd	Killingholme, Lincoln	189,000
Mobil Oil Co. Ltd	Corydon, Essex	175,000
Phillips-Imperial Petroleum Ltd	North Tees, Durham	100,000
Philmac Oils Ltd	Eastham, Cheshire	13,000
Shell U.K. Ltd	Ardossan, Scotland	6,000
Do	Heysham, Lancaster	26,000
Do	Shellhaven, Wales	200,000
Do	Stanlow, Cheshire	370,000
Do	Teesport	114,000
Texaco Ltd	Pembroke, Wales	180,000
Total		2,949,450

The Mineral Industry of Venezuela

By Roland W. Merwin [1]

Venezuela's gross domestic product (GDP) at constant 1968 prices was $14,786 million[2] in 1975, compared with a revised $14,021 million in 1974, an increase of 5.5%. The increase in the GDP reflected the strength of the Venezuelan economy in the face of a substantial reduction in the quantity of petroleum produced.

As in prior years, the petroleum industry continued to dominate the Venezuelan economy, although it employed less than 1% of the Venezuelan work force. In 1975, petroleum accounted for 26% of the GDP, and revenue from oil operations accounted for 77% of government income. Additionally, petroleum and petroleum products accounted for 96% of the total value of exports.

In 1975, 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. Venezuela, together with satellite refineries in the Netherlands Antilles, also maintained its position as the leading supplier of U.S. imports of petroleum and petroleum products.

At yearend 1975, Venezuela formally completed the nationalization of its petroleum industry, ending 62 years of private foreign control of the Nation's principal resource. The process of nationalization has dominated the petroleum sector during the past 2 years.

Nationalization proved to be an intricate process because of the complex industry infrastructure. The Government was aware of the need to retain access to foreign technology and to the markets that the private companies controlled, and sought arrangements that would satisfy these needs. Therefore, the nationalization law not only stipulated the payment of compensation for nationalized assets, but offered the former operating concessionaires an opportunity to engage in technical service and offtake contracts designed to maintain their participation in the industry.

Nationalization was initiated in March 1974 when Carlos Andres Perez, the then newly elected President of Venezuela, proposed that oil concessions revert to the Nation earlier than their expiration dates beginning in 1983. The draft of the nationalization bill was presented to the National Congress on March 11, 1975. After extensive debate, it was approved by Congress and signed into law on August 29, 1975. The law stipulated that nationalization would become effective on January 1, 1976, allowing, in effect, 4 months to organize the nationalized industry and reach agreements with foreign oil companies for their continuing participation in the industry during the postnationalization period. The day following the signing of the oil nationalization law, August 30, 1975, Petróleos de Venezuela (PETROVEN) was created by a presidential decree to administer the nationalized oil industry as of January 1, 1976.

These actions were followed by a series of legal steps involving offers of compensation to the 22 concessionaires and the additional 17 companies holding participating or joint operating agreements, the acceptance or refusal of the offers by the companies, and the formal signing of the

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[2] Where necessary, values have been converted from bolivars (Bs) to U.S. dollars at the rate of Bs4.20=US$1.00.

compensation agreements. Only one company holding a minority interest in a concession as a participant elected not to accept the offers. The process of nationalization was completed on December 31, 1975, when the 22 private oil concessions were terminated.

The nationalization law stipulated that payment of compensation for a nationalized asset would be on the basis of net book value, with no payment to be made for concession rights or projected future value of concessions, less tax and other obligations to the Government. The final compensation totaled $1.01 billion for the concessionaires and $22.7 million for participating companies. Additionally, payment for warehouse inventories totaling an estimated $117 million would be made during the first quarter of 1976. Company oil inventories totaling over 70 million barrels were also to be acquired in the same manner with PETROVEN to pay cost plus a 20-cent-per-barrel profit for the inventories.

The major portion of the compensation, over $900 million, was to be paid with Government of Venezuela bonds. The bonds are to pay 6% interest, be free of taxes, and be amortized over a 5-year period with an initial 1-year grace period. The redemption schedule calls for the first 20% of the bonds to be payable on January 15, 1977, and the remaining 80% in 16 equal quarterly payments beginning March 29, 1977. Normally, the bonds may only be negotiated outside of Venezuela. Within the country, the bonds may be utilized under conditions determined by PETROVEN for acquisition of crude oil and derivatives, and to meet the obligations of the Guaranty Fund.

The nationalization law required concessionaires to deposit 10% of the value of gross accumulated investment into a Guaranty Fund to cover any obligations not otherwise deducted from the compensation amount. In lieu of cash, the companies could utilize compensation bonds to fulfill the obligation. The total to be deposited with the Central Bank of Venezuela was estimated at $404 million. Together with prior cash deposits made under the terms of the 1971 Reversion Law, the Guaranty Fund would total an estimated $964 million.

The fund was to be maintained until verification was completed that the assests had been received in good condition. The nationalization law permitted a period of 3 years for the verification, but the Venezuelan Government planned to complete the process within 1 year. It was understood that 80% of the funds would be released to the companies when verification was completed. The remaining 20% would be retained for 3 years, and could also be drawn on to renovate equipment at dormant oil installations.

In addition to nationalization of the petroleum industry, Government policies were strongly directed toward strengthening the position of the Government-owned development agency, Corporación Venezolana de Guayana (CVG), which had a mandate to develop all heavy metallurgical industries in Venezuela.

The operations of CVG were located in the vicinity of Ciudad Guayana near the mouth of the Orinoco River. CVG acted as a holding company and operated through a complex system of operating companies with various degrees of ownership that include State, private, and even foreign interests on a minority basis.

In addition to major operating companies concerned with iron ore mining, iron ore beneficiation, and steelmaking, CVG controlled a number of other subsidiaries engaged in hydroelectric power generation and aluminum and cement production. In effect, CVG was responsible for all developments in the region including not only mineral related projects, but such programs as city planning for Ciudad Guayana and regional reforestation and agriculture projects.

The Ministry of Mines and Hydrocarbons continued with a wide range of mineral-related programs covering all aspects of Venezuela's mineral development with the exception of those projects that have been specifically assigned to PETROVEN and CVG. The most significant of the ministry's programs was planning for the development of the Orinoco heavy-oil belt. With an estimated resource of 700 billion barrels of heavy crude oil, these fields not only contain one of the world's largest hydrocarbon resources but are basic to Venezuela's long-range future as a major petroleum producer.

PRODUCTION

As in prior years, Venezuela's mineral production, in terms of both quantity and value, was predominantly based on the export-oriented crude petroleum and iron ore sectors of the industry.

Production of crude petroleum declined sharply from that of 1974 because of poor market conditions for the types of crude petroleum produced by Venezuela. Natural gas production also declined substantially because production, as a coproduct, was directly related to petroleum production. Iron ore production declined slightly from that of 1974 because of a decrease in world demand for steel.

Production of other minerals, mainly for domestic consumption, did not change significantly from that of 1974.

Table 1.—Venezuela: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum, unalloyed ingot	25,100	41,500	50,000
Gold, mine output, metal content ---troy ounces	19,020	16,966	18,326
Iron and steel:			
Iron ore and concentrate ---thousand tons	23,110	26,424	24,800
Metal:			
Pig iron ---do	546	545	535
Steel ingots and castings ---do	1,063	1,054	1,061
Semimanufactures ---do	--	37	NA
NONMETALS			
Cement, hydraulic ---do	3,413	3,494	3,455
Diamond:			
Gem ---carats	232,900	279,500	238,691
Industrial ---do	545,300	969,500	821,341
Total ---do	778,200	1,249,000	1,060,032
Fertilizer materials:			
Crude, phosphate rock, marketable	95,393	121,467	154,843
Manufactured, nitrogenous, gross weight	233,865	[e] 250,000	[e] 250,000
Gypsum	[e] 150,000	164,500	211,686
Salt, all types	[e] 220,000	223,173	289,849
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	[e] 8,000	18,000	17,000
Coal, bituminous	49,696	57,086	60,127
Gas, natural:			
Gross production ---million cubic feet	1,745,702	1,639,511	1,342,234
Marketable production ---do	459,936	475,969	450,295
Natural gas liquids:			
Condensate ---thousand 42-gallon barrels	1,174	1,250	1,434
Natural gasoline ---do	7,952	7,825	7,328
Liquefied petroleum gas ---do	23,382	21,521	18,901
Total ---do	32,508	30,596	27,663
Petroleum:			
Crude ---do	[r] 1,228,596	1,086,332	856,364
Refinery products: [2]			
Aviation gasoline ---do	213	288	242
Motor gasoline ---do	32,030	36,258	39,858
Naphtha ---do	37,125	33,694	19,044
Jet fuel ---do	16,400	12,521	8,251
Kerosine ---do	5,632	3,583	2,966
Distillate fuel oil ---do	58,308	48,300	50,253
Residual fuel oil ---do	304,229	280,479	178,302
Lubricants ---do	4,308	3,753	3,532
Other:			
Liquefied petroleum gas ---do	3,563	3,091	2,553
Asphalt and bitumen ---do	5,258	3,800	3,442
Refinery gas [3] ---do	7,166	5,504	5,283
Unspecified ---do	2,610	5,268	3,319
Total ---do	476,842	436,539	317,045

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

[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. In 1975, exports of crude petroleum and petroleum products were valued at $10,635 million and exports of iron ore were valued at $268 million. Together, they accounted for 98% of the total value of all exports.

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 Netherlands Antilles consisted of crude and unfinished oil destined for processing at two large refineries owned by the parent companies of Creole Petroleum Corp. and Cia. Shell de Venezuela Ltd., 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 1973–75 are shown in the following tabulation.

Destination	Exports (thousand 42-gallon barrels)		
	1973	1974	1975
Western Hemisphere:			
Canada	136,915	105,580	69,478
Puerto Rico	93,005	59,608	51,388
Trinidad and Tobago	12,933	6,118	996
United States	656,609	601,694	407,060
Other	160,872	137,782	163,863
Total Western Hemisphere	1,060,334	910,782	692,785
Eastern Hemisphere:			
Western Europe:			
European Community (EC)	48,559	84,936	80,960
Spain	10,476	10,678	9,043
United Kingdom	41,516	--	--
Other	19,681	11,486	9,225
Total	120,232	107,100	99,228
Other Eastern Hemisphere	50,975	49,037	9,968
Total Eastern Hemisphere	171,207	156,137	109,196
Grand total	1,231,541	1,066,919	801,981

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1973, 1974, 1975. Caracas, Venezuela, March 1974, March 1975, and March 1976.

Table 2.—Venezuela: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal including alloys:			
Scrap	611	1,437	Colombia 937, Argentina 500.
Unwrought	10,477	14,344	Colombia 5,447; Peru 3,912; Argentina 3,018.
Semimanufactures	407	990	Costa Rica 425; Colombia 150.
Copper metal including alloys:			
Scrap	1,355	--	
Semimanufactures	439	29	Colombia 8; Netherlands Antilles 8.
Iron and steel:			
Ore and concentrate thousand tons	21,500	25,850	United States 15,898; West Germany 2,094; United Kingdom 2,094.
Metal:			
Pig iron, ferroalloys, similar materials	NA	22,401	Italy 22,400.
Steel, primary forms		51,669	Argentina 40,000; Brazil 10,000.
Semimanufactures		6,798	United States 2,224; Netherlands Antilles 1,276; Brazil 1,087.
Lead metal including alloys, all forms	--	65	Colombia 50; Barbados 15.
Zinc metal including alloys, all forms	58	536	United States 423.
Other:			
Ash and residue containing nonferrous metals, n.e.s	122	488	United States 487.
Oxides, hydroxides, peroxides of metals, n.e.s	6	7	Panama 5.
Metals including alloys, all forms, n.e.s	--	16	United States 15.
NONMETALS			
Abrasives, natural:			
Pumice, emery, natural corundum, etc	22	3	Netherlands Antilles 2; Trinidad and Tobago 1.
Grinding and polishing wheels and stones, n.e.s kilograms	r 64	28	Jamaica 12; Bolivia 9.
Cement, hydraulic	131,678	132,703	United States 84,272; Surinam 25,288.
Clays and clay products (including all refractory brick):			
Crude clays, unspecified	704	401	Ecuador 400.
Products:			
Refractory	351	1,608	Dominican Republic 1,097; Chile 220.
Nonrefractory	780	1,076	Netherlands Antilles 491; United States 490.
Diamond, gem thousand carats	535	1,150	United States 460; Netherlands 430; Belgium-Luxembourg 150.
Diatomite	2,856	43	All to Netherlands Antilles.
Fertilizer materials, manufactured	262	14,433	Costa Rica 8,000; Peru 2,987; Dominican Republic 2,100.
Gypsum and plasters	18,600	15,500	Trinidad and Tobago 12,200; Surinam 3,300.
Lime	9	121	Brazil 119.
Precious and semiprecious stones, except diamond kilograms	389	7	All to Netherlands.
Salt	11,992	25,257	Bulgaria 12,000; Trinidad and Tobago 7,880.
Sodium and potassium compounds, n.e.s	931	560	All to Netherlands Antilles.
Stone, sand and gravel:			
Dimension stone	1,640	692	Trinidad and Tobago 382; Netherlands 222.
Crushed and broken stone for cement and lime manufacture	178	245	Netherlands Antilles 244.
Sand	11,909	4,920	Netherlands Antilles 3,787; Trinidad and Tobago 1,006.
Sulfur:			
Elemental	67,963	30,979	Colombia 15,125.
Sulfuric acid	30,554	30,600	United States 15,913; Netherlands Antilles 9,318.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	3,004	3,244	Brazil 1,075; Trinidad and Tobago 725; Ecuador 569.
Coal and coke, including briquets	--	14	All to Netherlands.
Hydrogen, helium, rare gases	10	26	Trinidad and Tobago 12; Netherlands Antilles 9; Brazil 4.

See footnotes at end of table.

Table 2.—Venezuela: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Natural gas liquids:			
Natural gasoline thousand 42-gallon barrels	7,027	5,963	United States 5,633.
Liquefied petroleum gas ------do	18,784	16,210	United States 10,839; Mexico 1,178; Brazil 1,059.
Petroleum:			
Crude and partly refined ------do	775,092	646,916	United States 202,548; Netherlands Antilles 195,720; Canada 89,170.
Refinery products:			
Gasoline ------do	430	23,386	United States 21,119; United Kingdom 1,034.
Naphtha ------do	31,304		
Jet fuel ------do	10,347	7,559	United States 5,038; United Kingdom 539.
Kerosine ------do	1,289	84	United States 79.
Distillate fuel oil ------do	26,350	23,027	United States 14,006; Panama 1,572; Canada 864.
Residual fuel oil ------do	314,741	289,808	United States 197,132; Netherlands Antilles 28,995.
Lubricants ------do	3,137	2,729	United Kingdom 1,193; Sweden 574.
Asphalt ------do	2,386	1,856	United States 1,761.
Other ------do	2,184	3,762	West Germany 1,073; Finland 387; United States 316.
Total ------do	392,168	352,211	

r Revised. NA Not available.

[1] Data for 1973 and 1974, excluding natural gas liquids, crude petroleum and refinery products, and iron ore, were derived from official Venezuelan export statistics. Data for the excluded commodities were derived from Ministerio de Minas e Hidrocarburos, Memoria y Cuenta, 1973 and 1974.

Table 3.—Venezuela: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	2,282	6,600	All from Guyana.
Oxide and hydroxide	57,140	82,435	United States 41,097; Jamaica 40,413.
Metal including alloys:			
Unwrought	1,874	176	United States 165.
Semimanufactures	5,423	5,687	United States 4,342.
Antimony metal including alloys, all forms	11	16	Netherlands 11; Belgium-Luxembourg 5.
Arsenic trioxide, pentoxide, acids	82	53	West Germany 38; United States 15.
Chromium:			
Chromite	6	6,481	Philippines 6,469.
Oxide and hydroxide	54	175	United States 124; West Germany 25.
Cobalt oxide and hydroxide	3	10	United States 9.
Copper:			
Copper sulfate	162	393	United Kingdom 241; Sweden 102.
Metal including alloys:			
Scrap	(1)	696	United States 663.
Unwrought	422	667	Peru 267; United States 258.
Semimanufactures	9,752	15,499	United States 4,375; Canada 3,450; Belgium-Luxembourg 2,305.
Gold metal, unworked or partly worked troy ounces	48,322	27,489	United States 26,524.
Iron and steel:			
Ore and concentrate	30	51	Australia 50.
Metal:			
Scrap	69,597	164,737	United States 151,870.
Pig iron, ferroalloys, similar materials	148,681	88,400	Brazil 51,421; United States 8,563.

See footnotes at end of table.

Table 3.—Venezuela: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Steel, primary forms	10,287	142,508	Japan 73,630; United States 41,478; West Germany 21,863.
Semimanufactures:			
Bars, rods, angles, shapes, sections	165,057	256,885	West Germany 66,836; Japan 51,148; United States 51,087.
Universals, plates, sheets:			
Uncoated	182,101	14,728	Japan 13,767.
Coated	385,907	582,289	Japan 355,043; Belgium-Luxembourg 56,546.
Hoop and strip	3,605	4,732	United States 2,048; Japan 691.
Rails and accessories	5,972	3,657	United States 3,560.
Wire	49,063	8,534	Japan 2,831; Belgium-Luxembourg 2,690.
Tubes, pipes, fittings	29,133	118,508	United States 64,601; Japan 30,725.
Castings and forgings, rough	1,792	3,498	United States 1,646; Italy 681.
Other	1,624	--	
Ingots and semimanufactures, alloy steel and high carbon	22,195	44,900	United States 13,923.
Lead:			
Oxides	879	1,283	Mexico 989.
Metal including alloys, all forms	5,247	7,310	United States 4,315.
Magnesium metal including alloys, all forms	300	489	United States 315; West Germany 174.
Manganese:			
Ore and concentrate	--	145	United States 98; Japan 47.
Oxide	2,772	1,780	Mexico 934; United States 750.
Mercury ....76-pound flasks	67	172	United States 93; West Germany 44.
Nickel metal including alloys, all forms	80	603	United States 500.
Platinum-group metals including alloys, all forms ....troy ounces	48,869	24,306	West Germany 16,397; United States 5,851.
Silver metal including alloys ....do	378,896	457,794	United States 304,820.
Tin:			
Oxides	4	9	West Germany 6; United States 2.
Metal including alloys, all forms	297	326	United States 99; Switzerland 93; Brazil 45.
Titanium oxides	4,157	1,800	Finland 557; West Germany 352; United Kingdom 337.
Tungsten metal including alloys, all forms	2	1	Mainly from United States and Italy.
Uranium metal including alloys, all forms ....kilograms	5,859	1,072	Japan 645; Mexico 427.
Zinc:			
Oxides	918	1,671	West Germany 550; United States 410.
Metal including alloys:			
Scrap and blue powder	374	1,039	Canada 282; United States 277; Mexico 250.
Unwrought	15,541	12,398	United States 3,718; Canada 2,379; France 2,180.
Semimanufactures	186	93	Japan 40; United States 24.
Other:			
Ore and concentrate	519	642	United States 391; Mexico 96; Japan 63.
Ash and residue containing nonferrous metals	1,570	9	All from United States.
Oxides, hydroxides, peroxides of metals, n.e.s	89	234	United States 105; Norway 46.
Metals including alloys, all forms	307	213	United States 172.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	401	218	West Germany 89; United States 74; Netherlands 42.
Grinding and polishing wheels and stones	368	64	United States 26; West Germany 22.
Asbestos	8,626	9,670	Canada 7,524.
Barite	54,003	53,754	United Kingdom 25,247; Peru 14,751.

See footnotes at end of table.

Table 3.—Venezuela: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Boron materials:			
Crude natural borates	241	270	Argentina 116; Spain 101; West Germany 50.
Oxide and acid	306	258	United States 107; Argentina 80.
Salts	1,246	953	United States 788; Belgium-Luxembourg 122.
Cement	1,840	1,550	United States 1,106.
Chalk	90	403	France 285; Belgium-Luxembourg 56.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	14,299	17,915	United States 17,825.
Fuller's earth	65	--	
Kaolin	17,824	17,075	United States 13,498; United Kingdom 3,089.
Other	7,279	4,022	United States 3,575.
Products:			
Refractory (including nonclay bricks)	2,039	1,526	United States 1,047.
Nonrefractory	1,529	1,960	Italy 1,468; Japan 380.
Cryolite and chiolite	2,483	29	Denmark 15; West Germany 11.
Diamond, industrial ---thousand carats	30	30	United Kingdom 15; United States 10.
Diatomite and other infusorial earth	3,591	5,283	United States 2,814; Mexico 2,303.
Feldspar	76	399	Mexico 211; United States 183.
Fertilizer materials:			
Crude	(1)	894	Netherlands Antilles 850.
Manufactured:			
Nitrogenous	49,194	26,440	United Kingdom 7,875; Spain 5,428.
Phosphatic	13,702	18,449	United States 7,174; Lebanon 5,824; Spain 5,250.
Potassic	(1)	4,520	United States 4,519.
Other, including mixed	6	4,631	West Germany 4,630.
Fluorspar	3,492	828	United Kingdom 606; Colombia 184.
Graphite, natural	225	357	United States 278; Italy 40.
Gypsum and plasters	418	570	West Germany 281; United States 156.
Iodine	5	6	West Germany 2; United States 1; United Kingdom 1.
Lime	86	99	All from United States.
Magnesite	r 19	4,535	Brazil 4,000; West Germany 528.
Mica:			
Crude, including splittings and waste	380	460	United States 425.
Worked including agglomerated splittings	6	20	West Germany 10; United States 6.
Pigments, mineral:			
Natural, crude	109	22	United Kingdom 12; United States 5.
Iron oxides, processed	622	1,662	West Germany 707; Spain 577.
Precious and semiprecious stones, except diamond, natural, synthetic kilograms	6,314	18,500	Mexico 5,502; United States 4,898; Brazil 4,762.
Pyrite	19	19	All from United States.
Salt	35	133	United States 95; United Kingdom 29.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	24,706	5,628	United States 4,180.
Caustic potash, sodic, potassic peroxides	353	2,333	Mexico 1,596; United States 438.
Soda ash	27,272	59,131	United States 49,395.
Stone, sand and gravel:			
Dimension stone, crude, worked	4,128	7,082	Italy 4,815; Portugal 814.
Gravel and crushed stone	37,424	218	Belgium-Luxembourg 101; France 75.
Dolomite, chiefly refractory grade	393	18,863	United States 18,766.
Quartz	109	188	Sweden 69; United States 61; Norway 47.
Sand	627	543	United States 210; West Germany 201.

See footnotes at end of table.

Table 3.—Venezuela: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Sulfur:			
Elemental:			
Other than colloidal	247	282	United States 199; West Germany 68.
Colloidal	422	85	United States 67; Belgium-Luxembourg 10.
Sulfur dioxide	165	81	United States 80.
Sulfuric acid	34	47	West Germany 20; Netherlands 10.
Talc and steatite	7,051	6,910	United States 3,682; Italy 1,801.
Other nonmetals, n.e.s.:			
Crude:			
Vermiculite	324	128	United States 38.
Mineral substances, n.e.s	309	783	United States 370; Canada 143.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	767	890	United States 872.
Oxides and hydroxides of magnesium, strontium, barium	3,592	6,505	Japan 5,150.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	52	51	All from United States.
Carbon black	477	751	United States 369; Canada 188; West Germany 164.
Coal, all grades, including briquets	60,192	2,694	United States 2,284.
Coke and semicoke of coal and lignite	334,000	229,639	Japan 128,516; West Germany 67,214; Colombia 32,105.
Natural gas liquids, unspecified 42-gallon barrels	10	--	
Petroleum:			
Crude and partly refined do	579	1,244	Italy 973.
Refinery products:			
Gasoline do	13	50	United States 45.
Kerosine do	600	10,286	Netherlands Antilles 7,765.
Distillate fuel oil do	80	59	All from United States.
Lubricants do	15,913	43,123	United States 34,533; Netherlands Antilles 4,123.
Other:			
Solvents do	802	289	United States 202.
Paraffin do	9,587	17,841	Japan 4,725; Colombia 4,394; West Germany 3,880.
Mineral jelly and wax (including petrolatum) do	5,933	10,127	United States 8,661; Netherlands 1,080.
Unspecified do	68,679	71,627	Netherlands Antilles 31,996; Italy 18,353.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 9,481	4,332	United States 4,122.

r Revised.
[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—The Government of Venezuela, working through CVG, was actively engaged in the development of a major aluminum industry that would be based upon the cheap hydroelectric power available in the Orinoco region. In anticipation of future electric power requirements for the proposed aluminum smelters, CVG was expanding the hydroelectric power generating facilities of its wholly-owned subsidiary Electricacion del Caroni C.A. (EDELCA).

The sole producer of aluminum metal in 1975 was Aluminio del Caroni, S.A. (ALCASA). ALCASA, jointly owned by CVG and Reynolds Metals Co., (50% each), was managed by Reynolds. Using imported alumina, ALCASA's capacity of 50,000 tons per year of aluminum metal was fully utilized within the plant for the manufacture of a wide range of finished aluminum products. During 1975, expansions were underway to increase both the aluminum smelter and rolling mill capacity to 120,000 tons per year by 1977. It was planned that the entire output would be marketed within Venezuela and other Latin American areas.

During 1975, organizational plans were completed, and initial construction started on Venezuela's second major aluminum facility, Industria Venezolana de Aluminio, C.A. (VENALUM). Owned 80% by CVG and 20% by Japanese interests, the VENALUM smelter will have a capacity of 280,000 tons per year, using imported alumina. It was planned that the major part of the output, in the form of aluminum ingot, would be exported to the European and Japanese markets so as not to conflict with the present market arrangements of ALCASA.

Because Venezuela's aluminum industries are entirely dependent upon imported alumina, considerable thought was being devoted to establishing an alumina industry. One possibility was alumina production facilities using imported bauxite. The other possibility was the utilization of low-grade bauxite deposits in Venezuela. In this connection, the Ministry of Mines and Hydrocarbons was actively engaged in exploration programs and metallurgy research in an effort to develop a viable bauxite industry in Venezuela.

Iron Ore.—The formal reorganization of Venezuela's iron ore industry was completed late in 1975, following the nationalization of the foreign sector of the industry at yearend 1974.

Under the terms of the nationalization agreement, the United States Steel Corp. and Bethlehem Steel Corp. were compensated for their assets on the basis of net book value. The compensation totaled $110 million, payable in the form of Government bonds. These two companies accounted for approximately 99% of Venezuela's iron ore production at the time of nationalization, with most of the output being exported to the United States.

Additionally, under the terms of the nationalization agreement, the former concessionaires were guaranteed continued access to the iron ore output over a period of years. United States Steel could take an annual output of 11 million tons of iron ore or equivalent product for 7 years. This could be reduced 50% by 1981 at the option of the company or the Government of Venezuela. Bethlehem Steel contracted for 3.3 million tons annually for 1975 through 1977 and could, upon a 1-year notice, continue to purchase an equal amount in 1978 and 1979. Under both contracts, prices were tied to Mesabi non-Bessemer Great Lakes prices with upper adjustments possible if European prices were higher. The purpose of these contracts was to provide stability to Venezuela's iron ore industry.

Throughout 1975, the former concessionaires continued to operate their individual properties in much the same manner as prevailed when they were private companies, subject only to general Government overview.

On December 10, 1975, the nationalization process was completed by the formation of CVG Ferrominera Orinoco C.A., a wholly-owned subsidiary of CVG. This corporation assumed exclusive responsibility for the development of Venezuela's iron ore industries including mining, beneficiation, exports, and domestic sales. One of Ferrominera's objectives was to carry out nationalization in such a way that neither the national interest, the production activities, nor the need of traditional clients suffer.

Government planning was such that iron ore production levels were expected to remain relatively stable. Contractual commitments would be met, but output would be gradually diverted from export markets to meet growing domestic needs. By 1990, if plans materialize, completion of a third steel plant should effectively convert Venezuela from an exporter of crude iron ore to a vertically integrated producer of beneficiated ores, steel, and steel products.

Production and exports declined in 1975, owing largely to the weakened world demand for steel. Production decreased 6% below that of 1974. Exports, which accounted for approximately 87% of the production, were 18% below those of 1974. Despite the sharp drop in exports, export revenue for 1975 fell less than 2% due to higher prices for iron ore in foreign markets.

Venezuela's iron ore reserves, grading 55% Fe or better, have been estimated at 1.66 billion tons, equivalent to a life of approximately 65 years based on projected production rates. Most of the reserves are located in the region southwest of Ciudad Guayana, adjacent to the present operations of Ferrominera.

Iron and Steel.—Venezuela had plans to expand iron and steel production to 15 million tons per year. The long-range objective was to fully utilize all of Venezuela's present and projected iron ore output. Most of the steelmaking capacity would be owned and operated by Government entities.

In 1975, about 85% of Venezuela's steel output was produced by CVG Siderúrgica del Orinoco S.A. (SIDOR), a wholly-owned subsidiary of CVG. The steel mill, which is located in the vicinity of Ciudad Guayana near the mouth of the Orinoco River, had a capacity of 1.2 million tons per year. In 1975, plans had been completed and construction was proceeding on expanding mill production to about 5 million tons per year.

SIDOR's operations and expansion plans were mainly based upon direct reduction/electric furnace processes, due in large part to the ready availability of high-grade iron ore, natural gas, and cheap electric power. In view of uncertainties as to the best reduction process to be used, several advanced direct reduction processes were being tested on a plant-size scale, some by SIDOR and others by companies associated with CVG.

With SIDOR's expansion program now well underway, the Venezuelan Government turned its attention toward construction of a second national steel plant to be located in western Venezuela in the State of Zulia, in the Marciabo region. As proposed, the complex would have the capacity of 5 million tons of steel per year. The Government placed authority for coordination of this new steel mill project in the hands of the State Regional Development Agency, Corporación de Desarrollo de la Region Zuliana (CORPOZULIA). In contrast to SIDOR's steel complex, CORPOZULIA planned to use blast furnaces and oxygen converters. Blast furnace feed would consist of beneficiated iron ore from Ferrominera's operations in the Orinoco region, and coke would be largely produced from local coal deposits. It has been announced that these coal deposits have satisfactory coking properties for metallurgical use when mixed with 10% to 30% of imported metallurgical coal.

The Government was planning, in a very general way, for the construction of another steel mill, likewise with a capacity of 5 million tons per year. However, at yearend 1975, no plans had been announced for either the location of the mill or the process to be used.

Other Metals.—During 1975, the Ministry of Mines and Hydrocarbons continued exploration programs designed to further development of several known metallic mineral deposits in Venezuela. Among these were a copper-lead-zinc deposit near Bailadores in the State of Merida; gold deposits in the State of Bolivar; lateritic nickel deposits in the States of Araqua and Miranda; and titanium deposits in the State of Yaracuy. However, at yearend 1975, this work was still continuing without conclusive results having been obtained.

NONMETALS

Fertilizer Materials.—Operating under the general leadership of the Government-owned Instituto Venezolano de Petroquimica (IVP), which operates with varying degrees of private and foreign capital participation, the Venezuela fertilizer industry made substantial gains in production during 1975. The fertilizer industry is mainly based upon the production of anhydrous ammonia using natural gas and the utilization of sulfur produced as a byproduct at refineries. The production of anhydrous ammonia in 1975 was twice that of 1974. The phosphate sector uses both domestic and imported phosphate rock. Although quantities of phosphate rock are limited, there are ample supplies of other raw materials for further expansion of the fertilizer industry. The Ministry of Mines and Hydrocarbons was continuing its program to develop phosphate rock reserves in the State of Falcon.

Other Nonmetals.—Activities included the unorganized production of diamond by small miners from alluvium deposits in the State of Bolivar, the production of cement by the country's large and stable cement industry, and the production of lime, sand, gravel, gypsum, clays, and stone for construction purposes. There were no major developments in the nonmetallic industries during 1975 because production of nonmetallic minerals had not been receiving priority consideration by the Government.

MINERAL FUELS

Coal.—During 1975, CORPOZULIA continued geologic studies and test corings to delineate the Guasare coal deposits in the State of Zulia. At yearend 1975, it was announced that proven reserves amounted to 780 million tons, 190 million tons of which could be mined by open pit methods. Concurrently, mining plans were being developed and metallurgical work was underway to develop treatment processes that would make the coal useful as a metallurgical coal suitable for coke to be utilized in the proposed steel mill in the vicinity.

Petroleum and Natural Gas.—Foreign oil companies continued to dominate Venezuela's petroleum and natural gas industry until, as a result of nationalization, they were taken over by PETROVEN at yearend 1975. At the same time PETROVEN acquired the assets and control of the State-owned Corp. Venezolana del Petroleo (CVP).

As created, PETROVEN became one of the major oil companies of the world. It inherited 7.5 million acres of oil concessions, 12 oil refineries with a combined capacity of 1.55 million barrels per day, 14 oil tankers, 131 gas injection plants, over 6,000 miles of oil, gas, and multiple purpose pipelines, a potential production capacity of about 3 million barrels per day, and a work force of 24,000 employees. PETROVEN's net worth was estimated to be approximately $2.1 billion.

It was intended that PETROVEN be given complete autonomy by the Venezuelan Government. It would announce its own exploration plans and formulate and execute its own programs.

PETROVEN was organized as a holding company with ownership and general control over 14 subsidiary operating companies as shown in table 4. These operating companies were formed around the present activities of the former oil companies and CVP so as to maintain continuity of existing operations.

The operating companies were expected to operate in much the same fashion as when they were private concerns. The company staffs were to remain intact with the exception of the Board of Directors, all of whom would be Venezuelans. Individual operating companies were expected to take the initiative in developing annual operational plans for production and proposing new investments. They would pay oil income taxes and royalties at the same rates as did the former private companies, plus 10% of the net revenue to the holding company. It was hoped that these revenue-producing functions would strengthen the operating companies in their efforts to maintain operational efficiency.

Concurrently with the nationalization negotiations, PETROVEN was offering technical service and offtake contracts to major former concessionaires in order to maintain their participation in the nationalized industry.

Under the terms of the proposed service contracts, the former concessionaires would provide a wide range of management and technical services both within and outside of Venezuela, including retention of foreign technical personnel, which would continue to be carried on the payrolls of the foreign companies. The contracts would be individually negotiated; payments would be based upon the range and quantity of services provided. They would provide overhead and profit margins so as to make the contracts financially attractive to the foreign companies.

Offtake contracts would be individually negotiated on a confidential basis between PETROVEN and foreign concessionaires. They would provide for the purchase during a fixed period (initially 3 months) of an agreed-upon quantity of crude petroleum and refined products at a negotiated price. These contracts were designed to provide a substantial continuity in the marketing of Venezuela's petroleum products in export markets.

The timing of nationalization was not the most opportune in terms of Venezuela's interests. Oil production peaked in 1970, and higher prices in subsequent years permitted the Venezuelan Government to begin a long-desired conservation program. However, production cutbacks were soon overshadowed by depressed world markets in 1975. These conditions combined to reduce export sales temporarily below the level set by the Government to support the national budget.

In 1975, crude oil production declined for the second consecutive year to the lowest level since 1955. The output was 21% below that of the previous year and was only 63% of the peak production in 1970. Production dropped steadily during 1975 from an average of 2.7 million barrels per day in January to 1.8 million barrels per day in December.

Table 4.—Venezuela: Distribution of landholdings, crude oil production, and refining capacity, by company, 1975

PETROVEN operating company	Principal former concessionaires: Company	Principal former concessionaires: Principal ownership or affiliation	Principal former concessionaires: Nationality of ownership	Operating area as of Dec. 31, 1975 (thousand acres)	Crude oil production (thousand 42-gallon barrels per day)	Refining capacity as of Dec. 31, 1975 (thousand 42-gallon barrels per day)
AMOVEN	Amoco Venezuelan Oil Co	Standard Oil Co. (Indiana)	United States	14	27	--
BARIVEN	Sinclair Venezuelan Oil Co	Atlantic Richfield Co	do	55	23	45
BOSCANVEN	Chevron Oil Co. de Venezuela, S.A.	Standard Oil Co. of Calif	do	139	38	61
CVP, S.A	Corp. Venezolana del Petroleo.	Government of Venezuela	Venezuelan	2,585	43	25
DELTAVEN	Texaco Maracaibo Inc	Texaco, Inc	United States	395	73	10
GUARIVEN	Sociedad Anonima Petrolera Las Mercedes.	Venezuelan investors	Venezuelan	222	2	--
LAGOVEN	Creole Petroleum Corp	Exxon Corp	United States	882	998	740
LLANOVEN	Mobil Oil Co. de Venezuela	Mobil Oil Corp	do	389	58	106
MARAVEN	Cia. Shell de Venezuela Ltd	Royal Dutch/Shell Group	British/Dutch	622	546	404
MENEVEN	Mene Grande Oil Co. C.A	Gulf Oil Corp	United States	1,799	373	159
PALMAVEN	Venezuelan Sun Oil Co	Sun Oil Co	do	58	126	--
ROQUEVEN	Phillips Petroleum Co	Phillips Petroleum Co	do	84	31	4
TALOVEN	Talon Petroleum Co., C.A	Venezuelan investors	Venezuelan	149	3	--
VISTAVEN	Mito Juan Concesionaria de Hidrocarburos, C.A.	do	do	117	5	--
Total				7,510	2,346	1,554

The principal crude oil producers during 1975 were Creole Petroleum Corp. (Exxon Corp), Cia. Shell de Venezuela, (Royal Dutch/Shell Group), Mene Grande Oil Co. (Gulf Oil Corp.), and Venezuelan Sun Oil Co. (Sun Oil Co.). Together they accounted for 86% of the total output.

The decline in production rates between 1974 and 1975, and during 1975 were due mainly to poor market conditions for the types of crude and refined petroleum produced by Venezuela, and the desire on the part of the Government to conserve the Nation's petroleum reserves. Additionally, the declines in production rates were partially influenced by the impending nationalization of the industry.

Because of an increasing lack of customer acceptance for heavy crude oils and residual fuel oils, there was a shift toward the production of lighter crude oils in 1975 relative to heavy crude oil production. The distribution of crude oil production by gravity, in million 42-gallon barrels is shown in the following tabulation:

Type of crude oil	1974		1975		Decrease	
	Quantity	Percent	Quantity	Percent	Quantity	Percent
Light (more than 25° API)	573	53	492	58	81	14
Medium (14° to 25° API)	338	31	241	28	97	29
Heavy (less than 14° API)	175	16	123	14	52	30
Total	1,086	100	856	100	230	21

Proven reserves of crude petroleum remained essentially unchanged, amounting to 18.5 billion barrels at yearend 1975 as compared with 18.6 billion barrels at yearend 1974. The projected life of the reserves was approximately 22 years at 1975 production rates compared with approximately 17 years at the higher production rates prevailing in 1974.

Natural gas production was 18% below that of 1974, reflecting the decrease in crude oil production. Essentially all of the natural gas produced was in the form of associated gas produced jointly with crude oil.

The conservation of natural gas has been a longstanding Government policy. The stated objectives are: To maximize the use of natural gas for beneficial purposes such as reinjection, and/or use in selected industrial processes; and to minimize the loss of gas by flaring. Reinjection of natural gas is considered beneficial because the gas would enable a higher percentage recovery of the petroleum resources and would itself constitute a natural resource upon depletion of the oil reserves. The distribution of natural gas production by use, as a percent of total production, is shown in the following tabulation:

	1973	1974	1975
Reinjected	44	50	55
Sold and used	26	29	34
Flared	30	21	11
Total	100	100	100

Proven reserves of natural gas increased 2% from 41.3 trillion cubic feet at yearend 1974 to 42.3 trillion cubic feet at yearend 1975. Of the total reserves at yearend 1975, 97% were in the form of associated natural gas in oilfields.

Venezuela's refining capacity has remained stable for several years at 1,554,000 barrels per day. Throughput has not approached this level during the past several years, mainly due to lack of sufficient market demand for the range of products produced by Venezuela's refineries. Refinery throughput declined in 1975 to 860,000 barrels per day compared with 1,196,000 barrels per day in 1974, a decrease of 28%. This represented a refinery capacity utilization of 77% in 1974 compared with only 56% in 1975.

As presently designed, Venezuela's refineries were heavily slanted toward the production of residual fuel oils. In 1975, this product accounted for 56% of the refinery outputs. This is a product for which there was a declining demand in domestic and world markets. The problem had not been resolved at yearend 1975; however, during the year, there was considerable discussion in Government circles as to the advisability of revamping refinery processes in order to obtain better yields of lighter products, both from the standpoint of international markets and of Venezuela's domestic needs. However, it was recognized that revisions of refineries to obtain increased yields of lighter products would require major investments.

In anticipation of the exhaustion of Venezuela's conventional crude petroleum reserves during the next few decades, the Ministry of Mines and Hydrocarbons has given priority attention to the development of the Orinoco heavy oil belt. The belt is located along the northern bank of the Oronoco River, extending about 375 miles in length and with a width of approximately 30 or 40 miles. Within the belt is located a series of nearly continuous oil deposits containing an estimated resource of approximately 700 billion barrels. The deposits are geologically similar to conventional oilfield deposits except for the characteristics of the contained crude petroleum. The crude oil ranges from 8° to 18° API. The sulfur content of the oil ranges from 2% to 5% by weight, and the sum of the nickel plus vanadium content ranges from 200 to 500 parts per million.

Throughout 1975, the Ministry continued its long-range program of geological investigations designed to delineate and characterize the deposits. Additionally, it initiated the drilling of a number of production wells for the purpose of testing production rates and problems.

Concurrently with the geological investigations and initial production tests, the Ministry was investigating overall processes that could be employed to obtain relatively complete extraction of the petroleum and resolve refining and marketing problems. One scheme being considered would involve a massive steam drive for the extraction of heavy crudes. This could be followed by a preliminary refining stage that would produce a semirefined oil suitable for further refining at downstream refineries. The preliminary refining stage would produce a coke containing the sulfur and the heavy metals. The coke could be further treated to recover the sulfur and heavy metals, with a production of synthetic gas that could be used to provide fuel for the steaming operation.

In view of the advanced technology and the large capital investment that would be required to develop the Orinoco heavy oil belt, Venezuela was actively seeking technical and/or financial assistance, preferably on a government to government basis or by international organizations. Conceivably, foreign oil companies might be asked to participate in the development of the belt since one section of the nationalization law provided for this contingency, subject to the approval of the National Congress.

The Mineral Industry of Yugoslavia

By Roman V. Sondermayer [1]

During 1975, Yugoslavia remained one of Europe's leading producers of nonferrous metals. The most prominent minerals with mine production expressed in approximate percentages of the world totals were as follows: Mercury, 6%; lead, 3.8%; zinc, 1.8%; bauxite, 3%; and copper, 1.6%. Production of other minerals and fuels was only of domestic significance. During 1975, gross social product (GSP) [2] increased by about 4.5% when compared with 1974. The minerals industry of Yugoslavia shared about 12% in GSP of the country and employed about 296,800 persons or 6.4% of the employed labor force.

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 coal and lignite, and imports of high-rank coals and coke were necessary. Although crude oil output reached 3.7 million tons, an alltime high, imports were necessary to meet two-thirds of the country's requirement. Iron and steel output continued below demand. Consequently, imports of large quantities of iron and steel semimanufactures were essential.

There were a number of significant developments during 1975. A 280,000-ton-per-year alumina plant was completed at Mostar, Bosna i Hercegovina (BiH). Construction continued on an alumina plant at Vlasenica and an aluminum plant near Mostar, both in BiH. Development continued on the Bučim copper deposit and on the nickel deposit near Rzanovo, both in Makedoniji (Macedonia). Production started at a 550,000-ton-per-year cement plant near Kosjerić, Srbija (Serbia), and at a 330,000-ton-per-year cement plant at Plevlja, Crna Gora (Montenegro). At Lukavac, BiH, a new coking battery went onstream with an annual capacity of 700,000 tons of coke. Construction started on a crude oil pipeline from the Adriatic to inland refineries in Yugoslavia, Hungary, and Czechoslovakia. Construction also continued on Yugoslavia's first nuclear powerplant, at Krško, Slovenija (Slovenia).

The mineral industry of Yugoslavia is state-owned. Investments of foreign capital in Yugoslavia's mineral industry are, nonetheless, possible provided that Yugoslav partners retain controlling interest.

PRODUCTION

No significant changes in the mineral production of Yugoslavia took place during 1975. Mineral producers directed their efforts toward modernization of existing facilities and construction of new installations, to process minerals to a higher degree and reduce the country's dependence on imported energy. Although investments in building new facilities are 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 1975.

Modern and efficient methods prevailed in petroleum exploration, production, and refining. All three primary methods of oil

[1] Physical scientist, International Data and Analysis.

[2] Gross social product (GSP) is an economic indicator published by Yugoslav authorities instead of gross national product (GNP). GSP and GNP are not comparable. GSP does not show value of services in its totals.

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.

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

Commodity [1]	1973	1974	1975 [p]
METALS			
Aluminum:			
Bauxite, gross weight ---- thousand tons --	2,167	2,370	2,306
Alumina, gross weight ----	274,721	272,740	[e] 330,000
Ingot including secondary ----	90,845	147,089	168,270
Antimony:			
Mine output, metal content ----	2,055	2,208	[e] 2,200
Metal (regulus) ----	1,999	2,349	2,159
Bismuth, smelter output ----	55	100	55
Cadmium, smelter output [e] ----	[r] 150	240	270
Chromium, chromite, gross weight ----	9,594	596	1,694
Copper:			
Mine output, metal content ----	[r] 111,797	112,116	114,960
Blister (includes secondary) ----	160,025	176,958	162,200
Refined (electrolytic):			
Primary ----	[r] 133,659	139,741	123,887
Secondary ----	3,841	10,265	14,015
Gold ---- troy ounces --	176,347	170,302	[e] 161,000
Iron and steel:			
Iron ore, gross weight ---- thousand tons --	4,671	5,239	5,239
Pig iron ---- do ----	1,955	2,126	2,100
Ferroalloys ---- do ----	[r] 154	190	196
Crude steel ---- do ----	2,676	2,836	2,916
Semimanufactures ---- do ----	[r] 2,042	2,235	2,359
Lead:			
Mine output metal content ----	119,312	119,826	132,000
Metal:			
Smelter, crude including secondary ----	112,632	118,428	[e] 150,000
Refined including secondary ----	98,033	113,876	126,099
Manganese ore and concentrate, gross weight ----	9,718	13,282	16,925
Mercury ---- 76-pound flasks --	15,606	15,838	16,941
Selenium, elemental ---- kilograms --	42,880	40,201	40,000
Silver, refined including secondary - thousand troy ounces --	4,302	4,702	5,412
Zinc:			
Mine output, metal content ----	97,428	94,682	100,900
Smelter including secondary ----	[r] 70,226	86,380	97,885
NONMETALS			
Asbestos ----	9,391	12,247	13,000
Barite ----	62,053	50,157	[e] 50,000
Cement, hydraulic ---- thousand tons --	6,376	6,647	7,065
Clays:			
Crude fire clay ----	300,236	317,658	[e] 320,000
Calcined fire clay ----	86,247	82,867	[e] 85,000
Feldspar, crude ----	[r] 50,807	56,094	[e] 60,000
Fertilizer materials, manufactured:			
Nitrogenous:			
Gross weight [2] ---- thousand tons --	1,381	1,389	1,392
Nitrogen content ---- do ----	276	278	278
Phosphatic:			
Gross weight [2] ---- do ----	963	818	803
Phosphorus pentoxide content ---- do ----	159	135	132
Gypsum:			
Crude ----	256,290	283,458	[e] 285,000
Calcined ----	72,911	89,591	[e] 90,000
Lime:			
Quicklime ---- thousand tons --	1,211	1,333	[e] 1,450
Hydrated ---- do ----	659	706	[e] 750
Magnesite:			
Crude ----	383,709	463,510	585,000
Sintered ----	169,709	269,029	256,588
Caustic calcined ----	5,961	15,301	[e] 18,000
Mica, all grades ----	[r] 124,587	143,240	174,176
Pyrite concentrate:			
Gross weight ----	216,732	254,741	346,000
Sulfur content [e] ----	91,000	107,000	145,000
Quartz, quartzite, glass sand ---- thousand tons --	1,424	1,520	[e] 1,550

See footnotes at end of table.

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

Commodity [1]	1973	1974	1975 p
NONMETALS—Continued			
Salt:			
Marine	50,940	23,375	26,000
From brine [3]	r 183,114	202,273	83,000
Rock	97,623	93,081	187,000
Total	r 331,677	318,729	296,000
Sand and gravel (except glass sand) thousand cubic meters	9,692	11,797	NA
Stone (except quartz and quartzite):			
Dimension:			
Crude:			
Ornamental do	43	49	NA
Other do	9	7	NA
Partly worked facing thousand square meters	549	592	749
Cobblestones, curbstones, and others thousand cubic meters	37	24	NA
Crushed and broken, n.e.s do	6,292	7,659	NA
Milled marble and other, n.e.s do	r 2,938	3,551	NA
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	15,366	18,576	e 20,000
Coal:			
Bituminous thousand tons	576	601	598
Brown do	9,145	9,380	9,430
Lignite do	22,729	23,601	25,509
Total do	32,450	33,582	35,537
Coke:			
Metallurgical do	1,249	1,245	NA
Breeze do	69	78	NA
Total do	1,318	1,323	1,351
Gas:			
Manufactured (city gas only) million cubic feet	5,942	6,848	NA
Natural, gross production do	46,933	51,100	54,879
Natural gas plant liquids:			
Natural gasoline and pentane thousand 42-gallon barrels	228	129	174
Propane and butane do	524	577	615
Total do	752	706	789
Petroleum:			
Crude oil:			
As reported thousand tons	3,332	3,458	3,692
Converted thousand 42-gallon barrels	24,680	25,613	27,347
Condensate:			
As reported thousand tons	399	506	NA
Converted thousand 42-gallon barrels	3,791	4,807	NA
Refinery products:			
Gasoline do	12,988	10,421	16,578
Jet fuel do	1,913	2,418	2,605
Kerosine do	93	99	
Distillate fuel oil do	r 19,702	20,986	21,015
Residual fuel oil do	23,177	28,751	28,478
Lubricants do	r 873	1,098	1,134
Other:			
Liquefied petroleum gas do	1,982	2,234	NA
White spirit do	205	231	217
Paraffin do	70	66	NA
Asphalt and bitumen do	1,976	2,115	2,344
Petroleum coke do	281	292	NA
Total do	r 63,260	68,711	72,371

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, and tellurium may be recovered as a copper refining byproduct 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.

TRADE

During 1974, the latest year for which data are available, Yugoslavia's mineral trade was diversified, but European countries were again the major purchasers. Nonferrous metals were the most significant export items. 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 countries.[3]

[3] 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	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite and concentrate thousand tons	1,707	1,611	U.S.S.R. 637; West Germany 368; Romania 227; Italy 172.
Alumina	86,622	76,333	Poland 32,000; Czechoslovakia 16,230; U.S.S.R. 14,916; Romania 7,378.
Metal including alloys:			
Scrap	5,559	4,935	Italy 3,342; East Germany 1,484.
Unwrought	42,216	69,758	Japan 25,931; West Germany 24,859; Italy 9,176; Argentina 5,097.
Semimanufactures	40,953	45,898	Czechoslovakia 14,369; United States 5,786; East Germany 2,882; Poland 2,685.
Antimony regulus	1,114	1,774	U.S.S.R. 1,138; United States 535.
Bismuth including alloys, all forms	5	36	United Kingdom 21; Italy 15.
Cadmium including alloys, all forms	78	53	United States 32; Netherlands 11; Italy 10.
Chromium:			
Chromite	3,060	10,011	All to Czechoslovakia.
Oxide and hydroxide	183	--	
Copper:			
Matte	7	--	
Copper sulfate	6,038	4,260	Italy 2,200; Greece 950; Albania 400; People's Republic of China 300.
Metal including alloys:			
Scrap	471	43	East Germany 25; Italy 17.
Unwrought	78,101	72,235	United States 43,407; People's Republic of China 14,985; Italy 6,069.
Semimanufactures	38,732	31,482	U.S.S.R. 6,616; Czechoslovakia 4,338; United States 4,212.
Iron and steel:			
Ore and concentrate	150	141	All to Czechoslovakia.
Roasted pyrite	1,846	909	All to Austria.
Metal:			
Scrap	21,624	1,082	Romania 663; Italy 379.
Pig iron, ferroalloys, similar materials	404,698	459,187	Italy 99,426; Austria 47,859.
Steel, primary forms	48,189	21,986	Romania 7,861; Hungary 6,690; Greece 4,010; Italy 2,060.
Semimanufactures:			
Bars, rods, angles, shapes, sections	260,481	260,400	Turkey 59,228; Lebanon 17,374; Bulgaria 16,320.
Universals, plates, sheets	135,762	145,800	U.S.S.R. 93,974; Italy 16,301; East Germany 12,391.
Hoop and strip	21,050	3,453	Italy 3,341.
Rails and accessories	60,988	54,232	Romania 37,299; Poland 5,490.
Wire	6,814	3,391	United States 949; Hungary 822; Italy 641.
Tubes, pipes, fittings	127,458	151,358	West Germany 24,996; Czechoslovakia 21,909; Italy 17,021.
Castings and forgings	17,836	17,806	Poland 6,967; Czechoslovakia 3,297; West Germany 1,665.
Lead:			
Ore and concentrate	18,220	23,289	U.S.S.R. 8,197; East Germany 8,114; Romania 6,764.

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

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Lead—Continued			
Oxides	685	--	
Metal including alloys:			
Unwrought	40,481	44,834	Austria 8,072; Czechoslovakia 7,104.
Semimanufactures	1,265	1,697	Italy 875; France 436; Libya 137.
Manganese:			
Ore and concentrate	380	4,818	All to Italy.
Oxides	50	--	
Mercury ____ 76-pound flasks	13,551	9,486	United States 8,151.
Nickel including alloys, all forms	338	269	East Germany 159; Italy 70; Austria 39.
Platinum-group metals including alloys, all forms, palladium __ troy ounces	--	2,861	Austria 1,576; East Germany 965; Netherlands 322.
Selenium, elemental ____ kilograms	40,784	34,700	United Kingdom 19,000; United States 10,000; East Germany 5,700.
Silicon	18,005	20,486	U.S.S.R. 7,888; United States 4,257; East Germany 2,017; Romania 1,706.
Silver metal including alloys, all forms thousand troy ounces	2,962	3,581	United States 2,286; Czechoslovakia 648; East Germany 451.
Tin including alloys, all forms	126	69	Italy 65.
Titanium oxides	1,674	8,887	West Germany 7,683.
Uranium ore and concentrate	--	2,042	All to Hungary.
Zinc:			
Ore and concentrate	50,852	1,410	Italy 1,021; East Germany 388.
Oxide	1,190	210	Italy 160; Albania 25; Switzerland 25.
Metal including alloys:			
Blue powder	2,141	1,948	Czechoslovakia 1,627; France 260.
Unwrought	34,559	40,697	Czechoslovakia 18,287.
Semimanufactures	9,736	8,180	East Germany 3,649; Czechoslovakia 2,137; Hungary 779.
Other:			
Ash and residue of nonferrous metals	6,414	1,226	East Germany 1,214.
Oxides, hydroxides and peroxides of metals, n.e.s	54	45	All to Spain.
NONMETALS			
Abrasives, natural, n.e.s., grinding and polishing wheels and stones	2,528	2,364	Poland 1,131; Romania 247; U.S.S.R. 239; Italy 232.
Asbestos	747	1,735	Albania 745; East Germany 478; Japan 300.
Barite and witherite	38,368	40,830	U.S.S.R. 25,579; Hungary 1,525.
Cement	88,703	234,692	Libya 117,803; Cyprus 52,935.
Chalk	51	38	Romania 20; U.S.S.R. 14.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	15,881	11,259	Poland 10,508.
Fire clay	14,129	18,343	Italy 17,793.
Kaolin	78	724	Italy 713.
Products:			
Refractory (including nonclay bricks)	77,696	109,779	East Germany 20,669; Romania 17,747; Poland 13,370; Italy 9,380.
Nonrefractory	4,106	1,649	U.S.S.R. 407; Libya 343; Czechoslovakia 311; Kuwait 200.
Diatomite and other infusorial earth	41	11	All to Greece.
Feldspar	18,223	17,448	Hungary 6,844; Czechoslovakia 3,234; Greece 2,480; West Germany 1,687.
Fertilizer materials, manufactured:			
Nitrogenous	42,857	6,250	Indonesia 5,000; West Germany 1,250.
Phosphatic	286,107	239,806	Hungary 219,851; U.S.S.R. 19,953.
Other including mixed	254,896	387,471	Hungary 146,503; Philippines 103,129.
Gypsum and plasters	61	--	
Lime	13,934	--	
Magnesite	87,147	70,874	Poland 18,331; United States 14,324; Italy 13,744; Canada 10,066.
Pyrite (gross weight)	22,391	24,327	All to East Germany.
Salt and brine	51	--	

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

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Sodium and potassium compounds, n.e.s	15,434	22,305	Italy 12,686; Brazil 6,206.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	54,364	58,319	Italy 35,069; West Germany 6,517; Czechoslovakia 5,281; East Germany 3,744.
Worked	6,809	11,151	East Germany 6,337; Austria 3,201; Czechoslovakia 1,354.
Dolomite, chiefly refractory grade	--	60	All to Greece.
Gravel and crushed rock	4,344	194	All to U.S.S.R.
Limestone (except dimension)	348	307	Hungary 175; Poland 103; U.S.S.R. 28.
Quartz and quartzite	15,582	23,276	East Germany 20,325; Austria 2,951.
Sand excluding metal bearing	238	3,404	Greece 2,975; Libya 277.
Sulfur:			
Elemental, other than colloidal	4,745	6,018	Romania 5,138; Bulgaria 792.
Sulfur dioxide	63	--	
Sulfuric acid	1,517	25,599	Romania 17,707; Italy 4,828; Albania 1,565.
Talc, steatite, soapstone, pyrophyllite	617	--	
Other:			
Crude:			
Calcite	60	100	All to Austria.
Unspecified	10	71	All to Greece.
Slag, dross and similar waste, not metal bearing	2,807	5,943	Italy 3,118; Austria 2,123; Albania 702.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	181	2,391	Czechoslovakia 1,411; Poland 935.
Coal and briquets:			
Anthracite and bituminous coal	1,156	--	
Lignite and lignite briquets	517,914	444,663	Austria 393,465; Italy 38,941.
Hydrogen, helium and rare gases kilograms	452	219	All to Libya.
Peat including peat briquets and litter	--	418	Libya 392.
Petroleum:			
Crude and partly refined:			
Crude thousand 42-gallon barrels	528	341	Greece 267; Cyprus 74.
Partly refined do	144	--	
Refinery products:			
Gasoline do	265	79	United Kingdom 33; Austria 12; West Germany 10.
Kerosine and jet fuel do	142	293	United Kingdom 98; France 30; U.S.S.R. 22.
Distillate fuel oil do	204	69	United Kingdom 28; Austria 10; East Germany 9.
Residual fuel oil do	406	107	People's Republic of China 15; Panama 14; Greece 12.
Lubricants do	7	55	United Kingdom 27; Austria 10.
Other:			
Liquefied petroleum gas do	178	12	All to Italy.
White spirit do	14	509	All to Austria.
Mineral jelly and wax do	41	33	Italy 16; East Germany 12.
Petroleum coke do	43	47	East Germany 45.
Unspecified do	403	1,249	Italy 283; Austria 216.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	3,776	13,943	Italy 10,804; Romania 5,790.

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

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate thousand tons	170	219	Australia 187.
Oxide and hydroxide	42,220	66,876	Guinea 63,242.
Metal including alloys:			
Unwrought	56,664	48,931	U.S.S.R. 32,989; Austria 6,468.
Semimanufactures	20,036	23,092	West Germany 8,375; U.S.S.R. 5,174; Austria 2,730; Italy 2,636.
Antimony:			
Ore and concentrate	1,677	2,862	Turkey 2,475; Thailand 387.
Metal including alloys, all forms	71	40	West Germany 20; France 19.
Arsenic:			
Trioxide, pentoxide and acids	68	54	United States 40.
Metal including alloys, all forms	4	17	West Germany 11.
Beryllium including alloys, all forms kilograms	75	201	West Germany 193.
Bismuth including alloys, all forms	8	24	Japan 10; Switzerland 5.
Cadmium including alloys, all forms	21	6	Bulgaria 3; Switzerland 2.
Chromium:			
Chromite	161,399	176,463	Albania 131,093; U.S.S.R. 40,257.
Oxide and hydroxide	417	120	Hungary 74; West Germany 44.
Metal including alloys, all forms	35	17	United Kingdom 9; West Germany 7.
Cobalt:			
Oxide and hydroxide	19	34	West Germany 19; Belgium 14.
Metal including alloys, all forms	46	42	Belgium 21; Zambia 12; West Germany 4.
Columbium and tantalum, tantalum, including alloys, all forms kilograms	215	423	United States 215; Austria 160.
Copper:			
Ore and concentrate	34,957	78,456	Chile 78,280.
Copper sulfate	20	755	All from U.S.S.R.
Metal including alloys:			
Scrap	(1)	57	All from United States.
Unwrought	59,357	29,366	United Kingdom 20,732; Chile 4,967.
Semimanufactures	13,328	6,338	West Germany 2,164; Belgium 842.
Germanium including alloys, all forms kilograms	52	54	Poland 50.
Iron and steel:			
Ore and concentrate	389,870	430,528	Brazil 300,504; U.S.S.R. 130,021.
Metal:			
Scrap	298,636	427,780	U.S.S.R. 288,434; Poland 49,065; Bulgaria 38,835; Hungary 35,404.
Pig iron including cast iron	34,507	62,325	U.S.S.R. 30,006; Czechoslovakia 20,597; Canada 8,775.
Sponge iron, powder, shot	2,094	2,239	Sweden 1,767; France 379.
Ferroalloys:			
Manganese	3,619	2,761	West Germany 1,453; Austria 671; Italy 240.
Other	3,674	4,778	West Germany 1,963; Austria 779.
Steel, primary forms:			
Blooms, billets, slabs, sheet bars	168,810	258,503	Czechoslovakia 61,133; U.S.S.R. 52,768; East Germany 21,585; Hungary 20,789.
Coils for recoiling	208,579	247,546	U.S.S.R. 86,124; Czechoslovakia 71,830; Bulgaria 27,935; Japan 23,230.
Semimanufactures:			
Bars, rods, angles, shapes, sections	239,889	289,576	Czechoslovakia 88,463; Greece 59,945; U.S.S.R. 29,170; West Germany 27,199.
Universals, plates, sheets	594,135	686,586	West Germany 128,116; Czechoslovakia 104,811; Japan 108,353; Italy 76,667.
Hoop and strip	106,918	78,704	West Germany 39,283; Austria 10,334; Italy 7,357.
Rails and accessories	3,374	5,485	West Germany 2,673; Austria 1,699; U.S.S.R. 959.
Wire	39,761	45,188	Romania 16,380; West Germany 15,733; Austria 5,969.
Tubes, pipes, fittings	65,971	71,697	East Germany 24,386; West Germany 17,620; Italy 15,755.
Castings and forgings, rough	678	1,073	West Germany 553; Italy 92.

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

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Lead:			
Ore and concentrate	3,768	6,232	United States 4,522; Canada 876; Italy 619.
Oxides	198	895	West Germany 375; Bulgaria 322; Austria 165.
Metal including alloys:			
Scrap	1,173	2,088	Liberia 670; Switzerland 328; Cyprus 306; Kenya 263.
Unwrought	13,736	18,907	Bulgaria 10,866; Zambia 4,045.
Semimanufactures	11	44	Italy 32; West Germany 11.
Magnesium metal including alloys, all forms	1,275	1,043	U.S.S.R. 610; West Germany 227.
Manganese:			
Ore and concentrate	56,688	74,176	U.S.S.R. 29,188; Gabon 18,000; Botswana 14,352; Zaire 12,446.
Oxides	1,817	2,950	Gabon 1,183; Greece 829; West Germany 366; Belgium 260.
Metal	157	321	Japan 163; Netherlands 60; West Germany 43; Switzerland 26.
Mercury ... 76-pound flasks	20	319	All from West Germany.
Molybdenum metal including alloys, all forms	16	15	Austria 7; West Germany 3.
Nickel metal including alloys, all forms:			
Scrap	11	--	
Matte, speiss, similar materials	20	22	All from United Kingdom.
Unwrought	1,366	1,031	United Kingdom 331; France 329.
Semimanufactures	1,428	705	West Germany 575.
Platinum-group metals including alloys, all forms:			
Platinum ... troy ounces	1,304	4,372	United Kingdom 1,929; West Germany 1,414; Italy 482.
Palladium ... do	26,007	38,291	U.S.S.R. 37,391.
Rhodium ... do	--	32	All from France.
Other ... do	841	1,446	United Kingdom 1,157; West Germany 161.
Silver metal including alloys ... thousand troy ounces	1,890	2,022	Switzerland 778; West Germany 725; Austria 266.
Tellurium, elemental ... kilograms	--	25,845	West Germany 25,830.
Tin:			
Oxides	15	12	All from West Germany.
Metal including alloys:			
Unwrought	1,356	1,612	Malaysia 1,448.
Semimanufactures	62	31	West Germany 18.
Titanium:			
Ore and concentrate	24,031	36,757	Australia 36,256.
Oxides	5,515	4,199	West Germany 1,884; France 1,135.
Metal including alloys, all forms	4	12	All from United Kingdom.
Tungsten metal including alloys, all forms	56	12	Austria 3; France 3; Netherlands 2; East Germany 2.
Zinc:			
Ore and concentrate	44,702	68,318	Canada 31,061; West Germany 9,259; Mexico 8,961; Czechoslovakia 8,235.
Oxide	138	158	West Germany 146.
Metal including alloys:			
Unwrought	27,995	26,010	Zambia 19,153; Bulgaria 3,967.
Semimanufactures	1,189	679	West Germany 592.
Zirconium including alloys, all forms	20	30	West Germany 22; France 5; Italy 3.
Other:			
Ore and concentrate:			
Of vanadium, tantalum, zirconium	1,497	246	West Germany 132; Australia 112.
Of base metals, n.e.s	50	--	
Ash and residue containing nonferrous metals	446	606	Austria 491; Switzerland 115.
Oxides, hydroxides, peroxides of metal, n.e.s	641	726	West Germany 500; Netherlands 67.
Metals including alloys, all forms:			
Metalloids	26	--	
Alkali, alkaline earth, rare-earth metals	173	240	France 148; West Germany 50.
Pyrophoric alloys	8	3	All from West Germany.
Base metals inciudnig alloys, all forms, n.e.s	25	--	

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

Commodity	1973	1974	Principal sources, 1974
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	1,011	319	Denmark 138; Greece 104; Italy 48.
Grinding and polishing wheels and stones	1,371	2,152	Austria 1,454; West Germany 233; Netherlands 213.
Asbestos	39,038	54,296	U.S.S.R. 33,464; Botswana 10,764; Canada 9,714.
Barite and witherite	1,362	1,363	West Germany 980; Czechoslovakia 146; Italy 110.
Boron materials:			
Crude natural borates	14,639	12,626	United States 10,184; Turkey 2,040.
Oxide and acid	1,252	1,466	West Germany 1,205.
Bromine	9	6	All from Austria.
Cement:			
Portland thousand tons	605	840	Romania 395; U.S.S.R. 281; Bulgaria 96.
Other do	264	162	Italy 103; Austria 58.
Chalk	966	1,082	France 913; Austria 156.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	334	1,444	West Germany 924; Greece 300; Italy 126.
Fire clay	15,017	18,591	Czechoslovakia 17,457.
Fuller's earth, dinas, chamotte	2,746	3,379	West Germany 1,360; Czechoslovakia 1,285; Austria 567.
Kaolin	48,768	48,332	Czechoslovakia 24,286; West Germany 12,969.
Other	5,557	5,689	Czechoslovakia 4,796.
Products:			
Refractory (including nonclay bricks)	24,213	29,772	West Germany 10,096; Austria 6,536; Italy 3,866.
Nonrefractory	223,234	315,669	Romania 89,457; Hungary 69,215; Bulgaria 53,595; Italy 45,639.
Cryolite and chiolite	750	750	All from West Germany.
Diamond:			
Gem, not set or strung carats	9,150	--	
Industrial do	225,585	--	
Powder do	125,850	--	
Diatomite and other infusorial earth	691	109	Austria 67; Czechoslovakia 26; Italy 10.
Feldspar	20	81	West Germany 49; Netherlands 19; United Kingdom 8; Italy 4.
Fertilizer materials:			
Crude, phosphatic thousand tons	1,025	1,199	Morocco 1,033; Jordan 84; Israel 36; Tunisia 26.
Manufactured:			
Nitrogenous	190,871	167,021	U.S.S.R. 94,345; Poland 23,506.
Phosphatic	25,504	20,966	Morocco 17,596; Austria 2,220; U.S.S.R. 1,103.
Potassic	331,222	383,421	U.S.S.R. 206,719; West Germany 153,353; West Germany 23,286.
Other including mixed	26,093	4,519	Poland 4,509.
Ammonia	40,166	45,594	Hungary 22,475; Czechoslovakia 20,421; Bulgaria 1,016.
Fluorspar	4,449	5,708	West Germany 3,392; Austria 945.
Graphite, natural	1,934	1,867	Austria 1,220; West Germany 280.
Gypsum and plasters	108	4,698	Poland 3,512; Romania 1,004.
Iodine	22	33	West Germany 13; Japan 12; Indonesia 4; Poland 3.
Lime	8,251	11,395	Bulgaria 11,391.
Magnesite	6,116	3,921	Turkey 2,984; Austria 739.
Mica:			
Crude including splittings and waste	187	266	Norway 120; West Germany 79; Italy 40.
Worked including agglomerated splittings	109	167	Austria 23; United Kingdom 22; West Germany 19.
Pigments mineral:			
Natural, crude	86	5	Austria 4.
Iron oxides, processed	2,165	4,199	West Germany 1,885; France 1,135; United Kingdom 367.

Table 3.—Yugoslavia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Precious and semiprecious stones, except diamond:			
Natural ---- kilograms --	82	68	West Germany 48; Switzerland 9; India 7.
Manufactured ---- do ----	207	267	West Germany 107; Switzerland 71; United Kingdom 58; Czechoslovakia 27.
Pyrite (gross weight) ----	210,942	231,452	U.S.S.R. 231,341.
Quartz, piezoelectric ---- kilograms --	1,741	1,214	United Kingdom 1,047; Brazil 150.
Salt and brine ----	114,279	128,603	Romania 84,955; Tunisia 31,290; U.S.S.R. 11,500.
Sodium and potassium compounds, n.e.s.:			
Caustic soda ----	87,373	101,856	West Germany 36,295; Italy 35,714; France 26,441.
Caustic potash, sodic and potassic peroxides ----	1,189	1,809	East Germany 1,199; Czechoslovakia 422.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous ----	3,896	4,548	Italy 4,191.
Slate ----	520	402	West Germany 340.
Other ----	2,679	2,887	Italy 2,869.
Worked:			
Slate ----	191	51	All from Italy.
Other ----	178	68	Do.
Dolomite, chiefly refractory grade --	5,723	5,499	Italy 4,334; Austria 808.
Gravel and crushed rock ----	72,630	124,993	Hungary 97,663; Austria 25,746.
Limestone (except dimension) ----	16,680	18,405	Hungary 18,347.
Quartz and quartzite ----	7,031	12,359	Greece 6,740; West Germany 4,911.
Sand excluding metal bearing ----	81,501	96,931	Italy 51,455.
Sulfur:			
Elemental, all forms ----	42,420	47,760	Poland 38,460; Italy 4,959.
Sulfur dioxide ----	63	33	All from Italy.
Sulfuric acid ----	61,125	104,123	Hungary 66,825; Italy 13,272; East Germany 12,187; Bulgaria 9,394.
Talc, steatite, soapstone, pyrophyllite --	2,040	3,027	France 1,079; Italy 876; Austria 310; North Korea 300.
Other nonmetals, n.e.s.:			
Crude ----	23,451	10,131	Hungary 8,729; Austria 1,030.
Slag, dross, and similar waste, not metal bearing ----	172,132	246,007	Italy 209,161; Hungary 28,697.
Oxides and hydroxides of magnesium, strontium, barium ----	325	407	West Germany 215.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural ----	1,453	1,398	Albania 1,094; West Germany 296.
Carbon black and gas carbon ----	9,609	6,972	Italy 4,406; West Germany 1,712.
Coal and briquets:			
Antracite and bituminous coal thousand tons --	1,964	1,946	U.S.S.R. 1,294; Czechoslovakia 563.
Briquets of anthracite and bituminous coal ----	200	29,630	All from U.S.S.R.
Lignite and lignite briquets ----	17,869	67,587	Hungary 66,329.
Coke and semicoke ---- thousand tons --	482	607	Poland 280; U.S.S.R. 140; Czechoslovakia 57.
Hydrogen, helium, rare gases kilograms --	2,355	77,044	West Germany 72,053.
Peat including peat briquets and litter --	4,636	7,212	Poland 3,844; Hungary 2,309.
Petroleum:			
Crude thousand42-gallon barrels --	61,206	51,842	Iran 22,078; U.S.S.R. 14,693; Iraq 13,734.
Partly refined ---- do ----	127	112	Italy 42; Czechoslovakia 28; West Germany 14.
Refinery products:			
Gasoline ---- do ----	285	419	Italy 169; Romania 125.
Kerosine and jet fuel -- do ----	45	112	U.S.S.R. 88; Romania 24.
Distillate fuel oil ---- do ----	2,751	373	Italy 149; Romania 104; U.S.S.R. 45.
Residual fuel oil ---- do ----	4,332	7,013	US.S.R. 5,574; Romania 1,139.
Lubricants ---- do ----	285	273	United Kingdom 35; Austria 28; Netherlands 28; Italy 28.

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

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other:			
Liquefied petroleum gas thousand 42-gallon barrels	131	209	U.S.S.R. 104; Bulgaria 81.
Mineral jelly and wax do	35	43	Hungary 12; East Germany 9; Romania 9; West Germany 8.
Nonlubricating oils, n.e.s do	48	70	U.S.S.R. 21; Hungary 14; Austria 7.
Bitumen and other residues, n.e.s do	630	2,018	Czechoslovakia 1,636; Hungary 285.
Bituminous mixtures, n.e.s do	28	35	Italy 14; West Germany 7.
Pitch do	29	91	West Germany 49; Italy 21.
Petroleum and pitch coke do	240	1,001	Albania 369; Italy 237; United States 220; Czechoslovakia 110.
Unspecified do	171	34	Hungary 13.
Total do	9,010	11,691	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	35,622	13,159	West Germany 7,603; Italy 3,741.

[1] Less than ½ unit.

COMMODITY REVIEW

METALS

The trend to greater processing of minerals and metals continued. The tabulation below shows the approximate share of the industry in GSP and in total employment of the country.

	Iron and steel	Nonferrous metals
Employment, number of persons	69,200	64,600
Percent of employed labor force	1.5	1.4
Percent of country's GSP	3.2	4.8
Percent of minerals industry	27.1	34.9

Aluminum.—The largest bauxite-producing areas were along the Adriatic coastline in Hrvatska (Croatia) (Obrovac), and inland at Montenegro (Nikšić) and BiH (Mostar and Vlasenica). During 1975, two aluminum plants and three aluminum electrolytic plants were in operation. The Sibenik plant, a 75,000-ton-per-year aluminum electrolytic plant located near Sibenik, Croatia, was the largest producer of aluminum in the country. Shortages of electric power limited production of aluminum to about 70% of capacity. Focal points of activities in the aluminum industry were the Bačevići-Mostar alumina and aluminum plant, the Vlasenica and Obrovac alumina plants, and the Titograd aluminum plant.

A 280,000-ton-per-year alumina plant went onstream at yearend at Bačevići near Mostar, BiH. The new plant was operated by Energoinvset of Sarajevo, BiH, and employed 700 persons. Total investment in the facility was equivalent to $30 million[4] and was financed by foreign and domestic credits. Alumina plants in production in 1975 are shown in the below tabulation.

[4] Where necessary values have been converted from Yugoslav dinars (din) to U.S. dollars at a rate of din 18=US$1.00.

Plant	Location	Approximate annual capacity (metric tons)
Kidricevo	Kidricevo-Slovenia	120,000
Titograd	Titograd-Montenegro	200,000
Bacevici	Mostar, BiH	280,000

Development continued at the Vlasenica project, a 600,000-ton-per-year alumina plant, at Karakaj, near Zvornik, BiH, partly financed with a $130 million 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. in repayment of the loan.

At Obrovac, Croatia, construction continued on a 300,000-ton-per-year alumina plant, financed in part by East Germany and Hungary, and expected to start production in 1977.

Copper.—Rudarsko Topionicarski 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 undertaking related to copper. However, development continued at the Bučim copper deposit, near Radovište, in Macedonia, expected to become the second-largest copper-producing facility in Yugoslavia.

During October, the eleventh section of the flotation plant in Majdanpek started production with a capacity of 1,400,000 tons of ore per year, increasing total annual flotation capacity to 12 million tons of ore. At the copper smelter in Bor, use of oxygen was introduced in furnaces for smelting copper. Management of Bor claims a 20% output increase without any actual smelter expansion.

Iron and Steel.—Renovation and expansion continued in the iron and steel industry. Domestic output of iron and steel products supplied only 64% of the country's 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 1975, iron ore was produced at four mines and was upgraded at four concentrators, one pelletizing plant, and seven agglomeration (sintering) facilities. Iron ore mines at Vareš and Ljubija in Bosnia, operated by Rudarsko Metalurški-Kominat, Zenica, Bosnia (RMK-Zenica), remained the largest producers of iron ore in the country, accounting for 78% of the total iron ore output of Yugoslavia. Domestic iron ore production supplied 90% of the country's demand. Management of the Vareš mine announced plans for expansion of its mining and concentrating facilities to 3 million and 2.4 million tons, respectively, by the early 1980's. In Macedonia new iron ore deposits were discovered at the villages of Pozarna and Mitrova Krsta, near Gostivar. Reserves and date for startup of production at these deposits had not been made public by yearend.

Pig iron was produced in seven facilities, eight plants produced steel, and seven rolling mills were operational during 1975. RMK-Zenica remained the major producer of steel in the country with a 34% share in the total.

At RMK-Zenica expansion of steel producing and auxiliary facilities continued. When expansion is completed in 1977, RMK-Zenica should have the capacity to produce 2.6 million tons of steel per year. During 1975, a new 840,000-ton-per-year steel converter plant went onstream at Metalurški Kombinat Smederevo (Smederevo) in Smederevo, Serbia. In addition, construction of an 840,000-ton-per-year rolling mill continued at Smederevo and its completion is expected in 1977.

Lead and Zinc.—Programs continued on expanding mines and flotation plants. The aim was to increase output of ores and concentrates to meet future domestic smelter demand and export requirements. During 1975, 18 mines produced lead and zinc ores; 14 flotation plants produced lead and zinc concentrates; 2 lead smelters, and 1 lead refinery were in operation. One Imperial Smelting Process plant produced lead and zinc, and two major zinc electrolytic plants processed zinc concentrates. "Trepča," Rudarsko-Metalursko-Hemijski-Kombinat Olova i Cinka, Kosovska Mitrovica, Serbia, (Trepča), with its mine at Stari Trg, lead smelter and refinery at Zvečan, and zinc electrolytic plant at Kosovska Mitrovica, all in Serbia, remained the major producer of lead and zinc in the country. Principal activities related to the lead and zinc industry were exploration, expansion of the Blagodat and Kišnica mines, Serbia, and construction of the flotation plant at Lece, Serbia.

Exploration for lead and zinc deposits was underway throughout areas near existing mines. Discoveries were announced near Vareš, Bosnia, and on Besna Kobila Mountain in Serbia. Reserves of newly discovered deposits were not made public.

However, reserves near the villages of Draškovac and Veočani, Bosnia, were reported as "large." Based on those reserves, a new mine was planned in the area. Reportedly, start of production was scheduled for the latter part of 1977.

At the Lece mine, Serbia, construction continued on a new 250,000-ton-per-year mill, a new shaft, and a new aerial tramway.

At the Trepča smelter, Zvečan, work continued on improving efficiency and safety conditions at the sulfuric acid plant.[5]

The Kišnica and Blagodat mines were slated for expansion by about 4,000 tons of metal per year each.

Nickel.—During the summer of 1975, development of mines and construction of a ferronickel plant started at Rzanovo near Kavadarci, Macedonia. Yugoslavia's Feni-Rudnici i Industrija za Nikel, Celik i Antimon, Kavadarci (Feni), will be the operator. Production of 16,000 tons of contained nickel was slated for startup in late 1978. Proven reserves of 34 million tons of ore with an average nickel content of 0.9% are adequate to sustain production for more than 15 years. Arthur G. McKee & Co. is the major foreign contractor. Total investments will be $208.7 million. Bankers Trust Co., along with Moscow Narodny Bank and Chase Manhattan, put together the financing of the Feni project.[6]

Other Metals.—Yugoslavia also produced bismuth, cadmium, chromite, germanium, gold, manganese, mercury, selenium, and silver in 1975. Except for mercury produced at Idria, Slovenia, output of the other metals was modest by world standards. 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. In addition, preparations were underway for production of platinum and platinum-group metals from sludges left after electrolytic copper recovery at Bor. Manganese was produced in Bosnia. Trepča was the main source of silver as a byproduct of lead and zinc processing.

NONMETALS

Cement and other construction materials remained the principal nonmetals produced in the country during 1975. Other nonmetals produced were magnesite, asbestos, pyrites, salt, and quartz sand. The estimated share of the nonmetals industry in the GSP of Yugoslavia was 1.3%; it was 11.6% of the total value of production of the minerals industry during 1975. The nonmetallic industry employed about 73,500 persons during 1975. Production of nonmetals remained the least developed segment of the mineral industry of Yugoslavia, and its significance was limited to the domestic economy. Mechanization and worker productivity was low. Lack of funds hampered successful development of the industry.

Asbestos.—Renovation continued at the Stragari asbestos mine, at Stragari, Serbia, operated by Stragari Asbest. New technology should enable the Stragari mine to produce 5,000 tons of asbestos per year by 1976.

Cement.—Cement output ranked first on the list of nonmetals produced in the country. Croatia and Serbia were the principal producing states, sharing in the country's total output by approximately 39% and 27%, respectively. Future plans call for a cement output of 17 million tons by 1985, compared with a domestic demand of 14 million tons. Consequently, some 3 million tons will be available for export. During 1975, controversy continued regarding the wisdom of such an extensive expansion of the cement industry.

Production started at a 550,000-ton-per-year plant at Kosjerić, Serbia, and at a 330,000-ton-per-year plant at Plevlja, Montenegro. Construction of a 1-million-ton-per-year plant near Anhovo in Slovenia continued during 1975. Reportedly, production will start during 1976.

Construction started on a 600,000-ton-per-year cement plant near Našice, Croatia, and on a 720,000-ton-per-year cement plant near Kakanj, Bosnia, both scheduled for production in 1978. Planning continued for a 600,000-ton-per-year cement plant at Ostruznica near Belgrade. Expansion and renovation continued at four plants: Beočin near Novi Sad, Serbia; Popovac, near Niš, Serbia; Podsused, near Zagreb, Croatia; and Dalmacija near Solin, also in Croatia.

Clays.—*Kaolin.*—Expansion of the kaolin mine near Karačevo, near Kosovska Kamenica, began. According to plans,

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[5] Nijaz Selimovic. Olovo (Lead). Politika, Jan. 16, 1976, p. 13.

[6] Engineering and Mining Journal. V. 176, No. 9, September 1976, pp. 112–113.

output should reach 70,000 tons of kaolin per year in 1978. Reserves of about 3.5 million tons of kaolin were reported at yearend 1975.

Gypsum.—Construction started on a 55,000-ton-per-year gypsum plant located in Donji Vakuf, Bosnia. The new facility is an addition to the existing gypsum plant. "Komar," the operating enterprise, will become the largest producer of gypsum in Yugoslavia when the project is completed. Total costs were reported at 26.4 million dinars or $1.4 million.

Lime.—During 1975, focal points of the lime industry were at Jelen Do, and Kučevo in Serbia; Drniš and Slavonski Brod in Croatia.

Construction started on a 70,000-ton-per-year hydrated lime plant located at Jelen Do, near Cačak, Serbia. The total costs were reported at 40 million dinars or approximately $2.2 million.

Two new lime furnaces and an installation for lime hydration were completed near Kučevo, Serbia. New additions increased annual plant capacity to 240,000 tons of lime. Reportedly, the Kučevo plant was the largest lime producer in the country during 1975. Construction continued on a new 100,000-ton-per-year lime plant located near Drniš, Croatia, and production was scheduled for 1977. Plans were made to build a 120,000-ton-per-year lime plant near Slavonski Brod, Croatia. Production was scheduled for 1978. However, at yearend 1975, funds for this project were not secured.

Magnesite.—The first Yugoslav plant for production of sinter magnesia from sea water was planned in Bar, Montenegro. Magnochrome, the largest processor of magnesite in the country, will cover construction costs of about $0.57 million. The initial annual capacity will be 100,000 tons of sinter magnesia. Employment will be 300 persons.

Sand.—During 1975, major quartz sand producers in Yugoslavia were the Rgotina mines, near Zajecar in Serbia, Valjevo nonmetallic mines, near Valjevo, Serbia, and Istria Sand mines near Pula in Croatia.

At the Rgotina mine, a new installation for processing quartz sand started production. Annual capacity of the new facility was reported at 100,000 tons of processed sand. Equipment was purchased in the United Kingdom and the plant is highly automated.

Plans for increased output were approved for the Istria Sand mine, near Pula, Croatia. Production of 60,000 per year tons of sand was scheduled to start in 1978. When all new facilities become operational, imports of foundry sands are expected to be eliminated from Yugoslavia's foreign trade.

Stone.—Construction started on a plant for processing ornamental stone near Knjazevac, Serbia. Plant capacity was planned at 22,000 square meters of ornamental stone (gabbro) and 20,000 meters of curb stone (granite). Total costs were estimated at 40 million dinars ($2 million). Employment will be 140 persons.

Construction was completed on a new limestone quarry and plant located at Banjani near Skopje, Macedonia. Annual capacity of the new installation is 3 million tons of limestone, if operated on three shifts. Costs were reported $4.8 million. Equipment was purchased in Italy and West Germany. The limestone mine and classifier are operated by the Skopje iron and steel works which is the major consumer of limestone produced at Banjani.

MINERAL FUELS

During 1975, Yugoslavia was dependent on imports of high-rank coals, coke, and crude oil. Petroleum was the main energy producing material; however, domestic low-rank coals remained the principal source of energy produced in Yugoslavia. Table 4 shows supply and apparent consumption of energy for 1973 and 1974.

The approximate shares of the fuels producing and processing industry in the country's employment and GSP are shown in the following tabulation:

	Coal and coke	Petroleum, natural gas, and refining
Employment, number of persons	68,100	21,400
Percent of employed labor force	1.5	.5
Percent of country's GSP	1.5	1.8
Percent of minerals industry	10.8	15.6

Table 4.—Yugoslavia: Supply and apparent consumption of energy-producing materials for 1973 and 1974
(In million tons of standard coal equivalent) [1]

	Total energy	Coal and coke	Petroleum and refinery products	Natural gas	Fuelwood	Hydro-electric power
1973:						
Production	25.8	16.5	4.9	1.8	0.5	2.1
Imports	16.5	1.9	14.6	(2)	(2)	(2)
Exports	.6	.2	.4	(2)	(2)	(2)
Apparent consumption	41.7	18.2	19.1	1.8	.5	2.1
1974:						
Production	27.3	17.1	5.1	2.0	.5	2.6
Imports	18.6	2.5	16.1	(2)	(2)	(2)
Exports	.8	.4	.4	(2)	(2)	(2)
Apparent consumption	45.1	19.2	20.8	2.0	.5	2.6

[1] 1 ton of standard coal equivalent (SEC) =7,000,000 kilocalories.
[2] Less than ½ unit.

Coal.—Brown coal and lignite comprised the bulk (98%) of Yugoslavia's coal output. About 93 mines were in operation. However, about 60% of output comes from six large producers, of which four are opencast mines. Approximately 2.5 million tons of bituminous coal, coke, and related products had to be imported during 1975 to meet additional demand.

Preparations were underway to initiate coal production in Macedonia. Equipment from the U.S.S.R. and East Germany was on location and removal of overburden started.

In Bosnia and Hercegovina, the largest coal-producing State, expansion of the Raspotočje mine near Zenica was completed when a new 1-million-ton-per-year shaft was put into operation in 1975. In addition, a new opencast coal mine, Gračanica near Bugojno in Bosnia and Hercegovina, started regular production after a trial period that began in 1974. Also, the Kreka Banoviči mines near Tuzla started to switch from underground mining to opencast production.

In Montenegro, development of the Petujak mine near Ivangrad, to produce about 300,000 tons of coal per year, was underway during 1975. Plans were also made to open another mining field at the village of Polica, also near Ivangrad. Design capacity of the Polica operation was 550,000 tons of coal per year. Proven reserves of about 150 million tons of coal, with calorific value of 3,000 to 4,500 kilogram calories per ton, are reported in the Ivangrad coal basin. Expected costs of $19.5 million apparently would be financed by loans from the U.S.S.R., West European banks, and domestic funds.

In the Kolubara Basin in Serbia, removal of overburden started at the new Tamnava opencast mine, which should produce between 18 million to 20 million tons of lignite per year when completed in 1980. For the Tamnava project six large rotary excavators, valued at 85 million German marks, were ordered from Ornstein Koppel of West Germany. In addition, three large self-propelled excavators, valued at $3 million, were ordered from the U.S.S.R., also for use in the Tamnava mine. In the Kostolac Basin, development continued on two new opencast mines, Drmno and Cirikovac. Four excavators, valued at $18 million, to be delivered between 1978 and 1980, were ordered from East Germany.

The energy crisis made marginal lignite mines in Croatia attractive, and plans for reopening the closed lignite mines and increasing production in operating mines were underway during 1975. A draft plan for 1980 calls for an annual output of 2 million tons in Croatia (output in 1974, latest year for which data were available, was 500,000 tons).

Coke.—During 1975, a fourth coking battery (700,000 tons per year) started production at Lukavac, and construction of another 700,000-ton-per-year coke battery was planned. The installation is operated by the Chemical-Coking Combine Boris Kidric at Lukavac in Bosnia. The Yugoslav authorities expect to end imports of coke during 1976. When the fifth battery is completed in 1978, the combine will have an annual capacity for production of 2 million tons of coke.

Construction continued on an 820,000-ton-per-year coking plant near Bakar, Croatia. The plant, when completed in 1977, will be operated by the Sisak Iron and Steel Plant in Sisak, Croatia.

Natural Gas.—Increased output of byproduct natural gas and high prices of imported crude oil made domestic natural gas more attractive. During 1975, principal activities were construction of a large gas pipeline system, construction of a new natural gas processing plant, and planning for an installation for production of ethylene.

Preparations for construction of gas transmission lines were underway in Serbia and Croatia. In Serbia, financial arrangements between domestic and foreign banks were concluded for the domestic share of total costs for the 1,268-kilometer trunkline between Senta 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 gas transmission line was under construction. The gasline will bring natural gas from Bokšić Lug gasfield to Osijek.

Construction of an 800-million-cubic meter-per-year natural gas processing plant started near the existing gas processing facility at Ivanić Kloštar, Croatia. The installation will produce about 80 million cubic meters per year of ethane. Ethane will be piped to Zagreb for use in a new 90,000-ton-per-year plant for production of ethylene. INA-Naftaplin was scheduled to manage the operation. INA-Naftaplin awarded the contract for design, engineering, purchasing, and site service for the ethane plant to J. F. Pritchard & Co., Kansas City, and Pritchard-Rhodes Ltd., London, subsidiaries of International Systems & Controls Corp. The contract value is about $26 million.[7] Financing for the gas processing plant was secured at yearend. A total of $72 million will be covered by loans from domestic banks and Lloyd Bank Ltd.

During 1975, INA and The Dow Chemical Co. were negotiating terms for a joint venture in Yugoslavia. Reportedly, a large petrochemical plant on Krk Island was considered. The Dow Chemical Co. would share 49% of total investment, and INA, the rest. If the agreement is concluded, the operation of the venture will be governed by the law permitting investments of foreign capital in the industry of Yugoslavia.

Oil Shale.—During 1975, Yugoslav authorities started reexamining technical and economic aspects of crude oil production from oil shales in Serbia near the town of Aleksinac. Reportedly, reserves total to 1,300 million tons of oil shale with an average oil content of 9% to 12%. Yugoslav oil reserves in oil shale are thus three times higher than oil reserves in oilfields. Financing and technology appeared to be the major problems in organizing the venture.

Petroleum.—Domestic production of crude oil reached an alltime high of 3.7 million tons in 1975. This increased output resulted from the startup of two new oilfields in Croatia and one in Serbia and in higher output from existing fields. The principal producing areas were in the Pannonian sedimentary basin, in the northern part of Yugoslavia, from east of Zagreb to the Romanian border and north from the Sava River to the Hungarian border. However, imports of about 68% of refinery throughput were required. Iran, Iraq, and the U.S.S.R. were the principal suppliers.

Industrija Nafta (INA), headquartered in Zagreb, Croatia, and Naftagas in Novi Sad, Vojvodina, Serbia, remained the only producers and most important refiners of crude oil in the country. INA was by far the larger, accounting for about 70% of the country's total crude oil output. Six refineries, three operated by INA, two by Naftagas, and one by Energoinvest had an installed annual capacity of 13.2 million tons.

Exploration, Development, and Production.—Exploration for hydrocarbons was conducted onshore in the Pannonian Basin and offshore along the Adriatic shoreline. INA in Croatia and Naftagas in Serbia carried out exploratory and development drilling for crude oil and natural gas. Both enterprises drilled a total of approximately 250,000 meters with 19 rigs in the Pannonian Basin. In Croatia, signs of possible crude oil production were reported on exploratory wells at Gakovo, Mihovljani, Kotoriba, and Peteranec. In Serbia, reports indicated discoveries of crude oil on exploratory wells at Karadjordjevo, Velike Livade, and natural gas near Begejac and Srpska Crnja. In addition to exploration in the Pannonian

[7] Wall Street Journal. No. 103, Dec. 22, 1975, p. 3.

Basin, INA and Jugopetrol-Adriatica (a joint venture between Buttes Gas & Oil Co. and Challanger Oil and Gas Co., a subsidiary of Global Marine Inc., and Jugopetrol-Kotor), carried out exploration offshore on the Yugoslav side of the Adriatic Sea. INA's activities were confined to the shoreline of Croatia (northern part of the Adriatic). During 1975, there was no offshore drilling in the northern part of the Yugoslav littoral. Data, obtained during previous offshore drilling, were studied. Locations were selected for drilling with INA's first offshore rig which should be delivered during 1976. The activities of Jugopetrol-Adriatica were conducted along the Coast of Montenegro (southern part of the Adriatic). Approximately 1,800 kilometers of seismic profile were recorded. Locations for the first offshore well were selected. The first well, Juzin Jadra, is located 17 miles offshore and is planned to be deeper than 10,000 feet. At yearend all preparations were completed and drilling was scheduled for early 1976. This well is the first well drilled in Yugoslavia under provisions of Yugoslav law permitting investment of foreign capital in the economy of the country.

All of the country's crude oil production comes from approximately 30 fields located in the Pannonian Basin. Beničanci, Croatia, operated by INA-Naftaplin, was the largest oil-producing field in Yugoslavia. Oilfields, Velebit and Kikinda, were the largest oil producers in Serbia. New oilfields Ladislavci-Kučanci and Obod in Croatia and Kikinda Zapad in Serbia statred production during 1975.

Refineries.—Six State-owned refineries processed a total of 10.9 million tons of crude oil during 1975 and operated at approximately 83% of its installed capacity. Imported crude accounted for about 66% of the total yearly throughput. Planning for construction of a new refinery near Skopje, Macedonia (2.5 million tons per year), planning to double present capacity of refinery Bosanski Brod, BiH (to 3 million tons per year), and reexamining economic aspects of a new refinery near Kopere in Slovenia were the focal points of the petroleum refining industry of the country. However, no actual action was taken on those projects at the 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. Construction started on the first crude oil trunk pipeline connecting Omisalj on the island of Krk in the north Adriatic with inland refineries in Yugoslavia, Hungary, and Czechoslovakia. The pipeline will start at Omisalj, on the island of Krk in the north Adriatic, where a new port will be built and will lead to refineries at Rijeka, Sisak, Bosanski Brod, Novi Sad, and Pančevo, with a branch to the Hungarian border and to Lendava. The pipeline is planned to be about 1,200 kilometers long. Approximately 735 kilometers will be in Yugoslavia. It 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. At yearend, financing of construction was secured. Loans from Libya and Kuwait, $70 million and $125 million, respectively, brought the total of funds available for construction to $550 million, which is considered to be adequate for the project. The pipeline was scheduled for initial operation in 1976; however, completion of the whole project is not expected before 1980. In addition, planning for a crude oil pipeline from Thessaloniki in Greece to a newly planned refinery near Skopje in Macedonia was underway at yearend.

Uranium and Nuclear Energy.—Construction continued on the 615-megawatt nuclear powerplant near Krsko, Slovenia. Construction was 5 months behind schedule at yearend. To fuel the reactor, domestic uranium concentrates (yellowcake-U_3O_8) will be enriched in the United States. To provide necessary ores and concentrates, development continued on the domestic uranium deposit near Zirovski Vhr, Slovenia. Reserves at Zirovski Vrh were considered adequate to support production of 300 tons per year of concentrates for a period of 15 years.

The Mineral Industry of Zaire

By Miller W. Ellis [1]

Zaire continued to have the world's largest mine production of industrial diamond, cobalt, and germanium and ranked sixth in production of copper. Production of columbium-tantalum, tungsten, and tin from the Kivu region increased, and output of industrial diamond from the Kasai region declined slightly. Production of crude oil from offshore wells commenced at yearend. Congestion at the port of Lobito and disruption of transport on the Benguela Railway increased as the struggle for control of the emerging independent Angola intensified. Alternative routes for both exports and imports were overtaxed even before military action stopped rail traffic to the west of the mineral-rich Shaba region. The loss of revenue to the mining companies and to the Government of Zaire resulted in curtailment or postponement of plans for expansion of the mineral industry and has weakened the country's financial position. Austerity measures were proposed, and in some cases implemented, to alleviate shortages of foreign exchange and energy, and to reduce inflation. Lack of essential supplies adversely affected mineral production, and shortages of consumer goods continued through 1975.

Following the December 1974 agreement of the Conseil Intergouvernemental des Pays Producteurs et Exporteurs du Cuivre (CIPEC) to reduce copper production for world markets 10%, the Zairian Government instructed the copper-producing companies to continue operations but to stockpile metal and concentrate in compliance with the cutback.

In February, it was announced that future exploitation of copper and cobalt deposits would be reserved for three companies only: La Générale des Carrières et des Mines du Zaire (GÉCAMINES), Société de Dévelopment Industriel et Minière du Zaire (SODIMIZA), and Société Minière de Tenke-Fungurume (SMTF).

The CIPEC countries announced another cut of 5% in the production-export of copper effective April 15, but there was no indication that any deliberate cut was required in Zaire in view of the deteriorating facilities for export of Zairian metal and concentrates.

A number of directives to the entire country also applied to the mineral industry. These included a wage ceiling of $1,834 [2] per month, with cuts in pay to Zairians (except teachers) in the income group earning more than $302 per month; an increase in wages for the low-income group; and price controls for foodstuffs and other essential consumer goods.

PRODUCTION AND TRADE

Mine production of copper, manganese ore, and refined zinc in the Shaba region dropped only slightly below that of 1974. Because of intermittent recovery, byproduct germanium output decreased 80%, cobalt 22%, and cadmium 3%, but silver production increased 35% to the highest figure reported since 1961. Production of zinc for export as concentrate decreased 10%, and nearly 6% less coal was mined in the Shaba region, where it was largely consumed. In the Kasai region, industrial diamond pro-

[1] Physical scientist, Division of International Data and Analysis.

[2] Where necessary, values have been converted from Zairian currency zaires (Z) to U.S. dollars at the rate of Z1 = US$2.00.

duction decreased 4%, and recovery of gem-quality diamond reportedly dropped 36%. Gold production, largely from the Kivu region, decreased 20%, although production of other Kivu minerals increased as follows: Columbium-tantalum, 74%; tungsten, 27%; tin metal-in-concentrate, 13%; and monazite concentrate, 35%. Refined tin from the Shaba region increased 13%.

The State-owned company GÉCAMINES continued to account for most of Zaire's foreign exchange earnings, and despite the relatively low prices prevailing throughout 1975, copper was the chief source of income for both GÉCAMINES and Zaire. Copper sales prices averaged 51.8 cents per pound for 1975, a 37% decrease from the 82 cents per pound realized in 1974. Details of mineral production are shown in table 1, and export data are shown in table 2. The last reported official information on imports was for 1970 and appeared in the Zaire chapter of the 1972 Minerals Yearbook.

Table 1.—Zaire: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
METALS			
Cadmium, smelter production	278	272	264
Cobalt:			
Mine output, metal content	15,052	17,532	13,638
Refinery production	15,052	17,565	12,355
Columbium-tantalum concentrate	56	46	80
Copper:			
Mine output, metal content	488,567	499,428	496,331
Blister and leach cathodes	460,479	454,000	462,600
Refined	[r] 223,557	254,572	225,900
Germanium, content of concentrates ----kilograms	3,296	61,653	11,865
Gold [1] ----troy ounces	133,650	128,989	103,217
Manganese ore and concentrate, gross weight	333,963	308,775	308,525
Rare-earth metals, monazite concentrate, gross weight	227	220	298
Silver ----thousand troy ounces	1,995	1,694	2,291
Tin:			
Mine output, metal content	[r] 5,442	4,436	4,562
Smelter, primary	[r] 969	571	647
Tungsten, mine output, metal content	242	196	248
Zinc:			
Mine output, metal content	[r] 87,559	84,464	80,400
Metal, primary, electrolytic	66,026	66,182	65,588
NONMETALS			
Cement, hydraulic ----thousand tons	537	577	[e] 600
Diamond:			
Gem ----thousand carats	1,294	620	394
Industrial ----do	11,646	12,991	12,416
Total ----do	12,940	13,611	12,810
Lime [e] ----thousand tons	150	150	150
Stone, unspecified ----do	[e] 750	NA	NA
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous ----do	115	95	89
Petroleum refinery products:			
Gasoline ----thousand 42-gallon barrels	947	1,034	1,056
Kerosine and jet fuel ----do	563	566	644
Distillate fuel oil ----do	1,334	1,278	1,191
Residual fuel oil ----do	2,166	1,953	1,352
Other:			
Liquefied petroleum gas ----do	25	20	21
Refinery fuel and losses ----do	351	278	232
Total ----do	5,386	5,129	4,496

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] Excludes gold recovered from blister copper.

Table 2.—Zaire: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974 [1]
Cadmium	295	NA
Cobalt metal, unwrought	17,144	NA
Columbium-tantalum concentrate	48	NA
Copper:		
Concentrate	75,000	93,528
Metal, unalloyed	464,168	445,662
Diamond ....thousand carats	14,189	(2)
Germanium metal, unwrought	(3)	NA
Gold ....troy ounces	135,387	NA
Rare-earth metals, monazite concentrate	213	NA
Manganese ore	485,000	165,445
Tin:		
Ore and concentrate	6,047	5,631
Metal, unwrought	900	523
Tungsten ore and concentrate	403	408
Zinc:		
Concentrate	7,625	4,393
Metal, unwrought	68,814	32,741

NA Not available.
[1] Data for 1973 are official statistics of Zaire as reported in Industrie Minière de la Republique du Zaire, Annual Report, 1973. Data for 1974 are from the United Nations Supplement to the World Trade Annual. V. III, 1974.
[2] Value only reported at $1,105,000.
[3] Value only reported at $372,000.

COMMODITY REVIEW

METALS

Copper, Cobalt, Zinc, and Associated Metals (Shaba Region).—The interruption of traffic over the Benguela Railway by military action in Angola delayed Zaire's plans for expansion of its mineral industry and, together with the low price of copper throughout 1975, seriously damaged the country's economic position. The Belgian firm Société Général des Minerais (SGM) continued to assist with copper marketing but was able to turn this function over to the Société Zairoise de Commercialisation des Minerais (SOZACOM) by yearend.

GÉCAMINES accounted for 93% of Zaire's production of copper, all of its production of cobalt, zinc, germanium, and cadmium, most of the silver, and 21% of the gold. Zinc was a coproduct at the underground Kipushi mine, with germanium, cadmium, and silver as byproducts. GÉCAMINES' two other underground and six open pit mines continued to produce copper and, as byproducts, cobalt, silver, and gold. Sulfuric acid was also produced and used in metallurgical processing.

As scheduled in the expansion program, GÉCAMINES commenced open pit mining of the deposits at Dikuluwe and Mashimba in the fall of 1975, but shortages of imported diesel fuel oil prevented full-time operation of heavy equipment at both mines. Construction of additional concentrating, smelting, and refining facilities as well as housing for employees in the Kolwezi area, was delayed by transport difficulties. Full utilization of these facilities depended on completion of the 1,000-kilovolt direct-current transmission line from Inga, which was also behind schedule.

The Japanese-operated company SODIMIZA produced 94,300 tons of concentrate containing 34.4% copper, or 32,439 tons of copper metal, from the Musoshi mine, and continued to develop the Kinsenda deposit and to explore known deposits in adjacent areas along the Zambian border to the east. The concentrator at Musoshi had the capacity for 140,000 tons of ore per month and was to treat ore from the Kinsenda mine, where problems with mining and water extraction had to be solved.

Zaire's third potential copper-cobalt-producing company, SMTF, was unable to maintain its schedule for construction of a new mining, roast-leach, and electrowinning complex east of Kolwezi because transport of essential supplies was interrupted. Restrictions on externalization of employees' earnings made it difficult to retain skilled staff. Zaire's deteriorating international credit position also contributed to the delay of the project, in which U.S. capital and contractors were involved. Contracts for construction of housing, awarded to French and Zambian firms, were nearing completion. Construction of the metallurgical complex by the U.S. firm Fluor-Utah, started in February 1975 but was delayed later in the year.

Columbium-Tantalum, Gold, Tin, and Tungsten.—Alluvial and eluvial cassiterite had been produced for more than 50 years from weathered soils overlying extensive pegmatite deposits south of Manono in the north-central part of the Shaba region. Hard unweathered ore was left in place or stockpiled for future treatment when the spodumene and other lithium minerals in the gangue could be recovered. The major tin-producing company in the Shaba region, Zairetain, investigated the feasibility of exploiting what it claimed as the world's largest spodumene deposit. Construction of a plant at a cost of $4 million for producing 5,000 tons of lithium carbonate per year was proposed. Meanwhile, Zairetain continued extraction of the heavier minerals, including 30 tons of columbite-tantalite and nearly 1,000 tons of cassiterite, and reported the production of 647 tons of tin metal worth more than $5 million from its smelter at Manono. The smelter used slightly more than one-fourth of the 45-megawatt capacity generated by Zairetain's hydroelectric plant on the Luvua River, 90 kilometers to the east.

Following the closure of the Benguela Railroad, some of the production was sent downriver to Matadi on the "National Route", which proved costly in terms of time and losses. Most of the production was shipped by truck to Muyumba on the Lualaba River, by barge to Kabalo 200 kilometers downstream, by rail to Kalemie on Lake Tanganyika, by lake steamer to Kigoma, and again by rail across Tanzania to the congested port of Dar es Salaam. Shipping time via this route averaged 3 months, only slightly longer than the Benguela–Lobito route in Angola.

In the Kivu region to the north, Compagnie Belge d'Enterprises Minières (COBELMINE) was the major operator following amalgamation of eight previously independent companies.

Arrangements were made for the incorporation of Syndicat Minière de l'Etain (SYMETAIN) and COBELMINE into a single organization. Production by the two companies for 1975 follows:

	COBEL-MINE	SYME-TAIN
Cassiterite --metric tons--	3,005	2,384
Tin content at 70% -do----	2,103	1,669
Wolframite ---------do----	405	10
Monazite -----------do----	298	--
Columbite-tantalite --do----	6	--
Gold ---------troy ounces--	18,500	--

Manganese.—Zaire's manganese ore production was from the Kisenge deposit near the Benguela Railway line, about 100 kilometers east of the Angolan frontier at Dilolo. Société Minière de Kisenge (SMK) mined and crushed oxide ore containing 48% to 51% metal and also mined carbonate ore with 35% manganese content. In 1975, SMK produced 171,147 tons of ore, including 6,415 tons of carbonate, and exported 127,866 tons for revenues of $11,794,826, which included some 1974 sales.

After closure of the Benguela Railway, the company continued to mine and stockpile ore because the unit price for manganese ore was too low for profitable export by any alternative route.

NONMETALS

Cement (Shaba Region).—Cimenteries du Shaba (CIMSHABA) marketed cement in the Shaba and neighboring Kasai regions and sold lime to GÉCAMINES from its plant in Lubumbashi. Production dropped to 76.5% of the 1974 level, largely owing to lack of firebricks from Europe, which failed to arrive during the year. CIMSHABA was taken over by the Zairian Government on March 15, 1975. It reported revenues of $3,700,260 with an after-tax loss of $1,099,118 for the production of 70,143 tons of cement, 6,646 tons of lime, and 3,667 tons of ballast.

Diamond, Industrial and Gem (Kasai Region).—With a decline of only 4.4% from the 1974 record, Zaire retained its leading position among world producers with 12,416,000 carats of industrial diamond from extensive deposits near Mbuji Maya. Production of gem-quality diamond dropped 36% to a new low of 394,000 carats. Most of the mines were operated by the Zairian company Société Minière de Bakwanga (MIBA), which also purchased diamond recovered by the few independent operators licensed to mine.

MIBA verified that exploration drilling had outlined a 4-million-ton deposit of nickel ore containing more than 1% nickel in the rugged country of Lushatsha, west of Mbuji Maya.

MINERAL FUELS

Coal (Shaba Region).—The Luena coalfields in northern Shaba produced 89,018 tons of coal in 1975, 6.4% less than in 1974. GÉCAMINES mined and consumed most of the high-ash coal. A small amount of coal was imported from Zambia.

Petroleum.—Zaire continued to import crude oil for the Moanda refinery north of the port of Banana. The Zairian-Italian Refining Company (SOZIR) produced 614,663 tons of petroleum products, a decrease of 11.9% compared with the 1974 output. Production of high-test and aviation gasoline increased 10%. The greatest decline, 33.7% in fuel oil, was particularly unfortunate for the mining industry. Substantial amounts of fuel oil were also imported, but from July through November, transport difficulties caused intermittent operation of diesel-powered equipment at several mines in the Shaba region.

SOZIR announced plans to increase the capacity of the Moanda refinery from 750,000 to 1.3 million tons per year. Three tugboats and nine 1,650-ton tanker barges shuttled crude oil from oceangoing tankers moored near the port of Banana to the unloading docks, where it was pumped through a pipeline to the crude oil storage tanks at the Moanda refinery.

Zaire became Africa's 10th oil-producing country in late 1975 when Gulf Oil Corp. and partners commenced production from two oilfields discovered off Zaire's 40-kilometer coastline in 1971 and 1973. The GCO Field (six wells in 20 meters of water 16 kilometers offshore); and the Mibale Field (three wells in 6 meters of water less than 5 kilometers from shore) tapped reserves estimated at 200 million barrels of oil and 50 billion cubic feet of natural gas. The gravity of the crude oil was between 31.7° and 33.2°, and the sulfur content was slightly more than 0.11%. The high wax base caused pour points of 65°F for GCO crude oil and 80° to 95°F for Mibale crude oil, which made it an unsatisfactory raw material for the Moanda refinery.

Crude oil from both fields was pumped through a submarine pipeline to a storage vessel moored north of the GCO Field. Another submarine pipeline conveyed it to a mooring buoy and loading point for tankers.

The Mineral Industry of Zambia

By Miller W. Ellis [1]

Zambia maintained its position as the world's fifth largest producer of copper in 1975. Despite a prolonged depression of prices on the international market, copper continued to provide most of Zambia's foreign exchange. The Government of Zambia, as majority shareholder, concluded agreements to terminate management and sales contracts with the chief minority shareholders of Nchanga Consolidated Copper Mines, Ltd. (NCCM), and Roan Consolidated Mines Ltd. (RCM). As compensation for early termination of these contracts, Anglo-American Corp. and American Metal Climax Inc. have accepted $51.5 million and $34.3 million,[2] respectively, paid in quarterly installments during a 3-year period. A separate company, the Metal Marketing Corporation of Zambia, Ltd. (Memaco), was made responsible for negotiating all sales of Zambia's metal products.

As a member of the Conseil Intergouvernemental de Pays Exporteurs de Cuivre, Zambia agreed in March to curtail copper production by 15%.

Civil unrest in Angola disrupted and finally halted traffic on the Benguela railway which had carried about half of Zambia's trade via the Atlantic port of Lobito. Alternative truck routes through Malawi and Mozambique were able to handle only about 20% of Zambia's traffic. The remainder moved slowly through the congested Indian Ocean port of Dar es Salaam, after Tanzania imposed weight restrictions on trucks carrying cargo in transit through Tanzania to or from the Kenyan port of Mombasa.

The Tanzania Zambia Railway TAZARA track was linked with the Zambia line in September and, although the new line was not fully commissioned, it carried an increasing amount of Zambia's trade during the last quarter of the year.

In September, the two major copper producers, RCM and NCCM, declared *force majeure* of 20% and 30%, respectively, on their copper deliveries. The following month this was increased to 30% and 40%, respectively. Both companies postponed projects for expanding the mining industry, and some smaller producers ceased operations because of increased delays in receipt of equipment and the escalation of production costs.

PRODUCTION AND TRADE

Transport of Zambia's products to, and its essential requirements from, the world's markets was a vital factor in Zambia's trade. In 1975 the cost of such transport increased drastically as did the time lag between the order and receipt of equipment and supplies, and between the shipment of products and delivery to the overseas market. Foreign exchange payment had to be made when orders were placed and exchange credit was not available until delivery was accomplished so that Zambia's overseas suppliers and customers benefited while goods were in transit.

Prior to the closure of the Rhodesian border in 1973, 55% of Zambia's exports

[1] Physical scientist, International Data and Analysis.
[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.

and 66% of its imports had been shipped via Rhodesia and handled through Mozambique ports. With the closure of the border, rail shipments through Zaire and Angola via the Benguela railway were increased to 55% of exports and 45% of imports, and most of the remainder was trucked to the Indian Ocean ports of Dar es Salaam in Tanzania and Mombasa in Kenya. Some use was made of the completed portion of the Chinese-built TAZARA, which had progressed from Dar es Salaam into northeastern Zambia by the end of the rainy season in April 1974. Truck haulage to both ports continued but haulage to Mombasa was curtailed when Tanzania imposed weight restrictions on trucks carrying cargo to or from the Kenyan port of Mombasa. Construction of increased cargo handling facilities at Dar es Salaam was not sufficiently advanced to prevent congestion and accumulation of cargo at the harbor.

Civil disturbances in Angola began to disrupt traffic on the Benguela railway, and congestion at the Atlantic port of Lobito increased as did the number of ships awaiting berthing space at both Lobito and Dar es Salaam.

When Benguela traffic was stopped by hostilities in August, more than 100,000 tons of Zambia-bound cargo was stranded at Lobito. Much of it spoiled or was lost and the remainder was reconsigned, at considerable extra cost, to Indian Ocean Ports. A substantial amount of copper for export was impounded or lost, and nearly 800 railway cars were reportedly stranded in Angola.

Construction of a new road was accelerated for a more direct link with the Mozambique railway system and port of Beira, and truck haulage was increased across Malawi and Mozambique to the port of Nacala but deteriorating road conditions and port facilities were inadequate to handle more than about 20% of Zambia's traffic.

Track laying on the TAZARA route was also accelerated and the line was linked to Zambia's railway at Kipiri Mposhi in September 1975 when trial shipments started on a limited basis moving wheat from and Zambian copper to Dar es Salaam. Upgrading of the track and construction of loading facilities continued into the rainy season (November through March), but provision of adequate rolling stock and commissioning of full-scale operations were not anticipated before mid-1976. Increased dockage and cargo-handling facilities at Dar es Salaam were relieving port congestion by yearend.

The normal escalation of transport cost was further increased by demurrage and transshipment charges, and by increased production costs due to delayed arrival of vital equipment. The results were reduced profits and even net losses on the part of the mining companies and a loss of tax revenue by the Government of Zambia. Depressed copper prices and increased costs contributed to the negative balance in 1975. The value of Zambia's 1971–75 trade, in millions of dollars, is shown in the following tabulation:

	1971	1972	1973	1974	1975
Total exports (A)	679	845	1,160	1,401	[e] 816
Copper exports (B)	654	814	1,092	1,309	[e] 735
Total imports (C)	559	628	544	794	[e] 936
Balance (A–C)	120	217	616	607	[e] –120

[e] Estimate.

The balances do not indicate an accumulation of foreign exchange credits which were also required for loan repayments, dividends to overseas shareholders, and other disbursements. A satisfactory balance was held at yearend 1973 but this was largely exhausted in 1974, and by yearend 1975 a current account deficit of more than $650 million was only partially offset by new loans to the mining companies and by government borrowing from overseas sources.

Zambia's mineral production is shown in table 1. Table 2 shows exports and destinations of mineral commodities, and table 3 lists the amounts and sources of mineral imports.

Table 1.—Zambia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
METALS			
Cadmium metal	15	13	e 15
Cobalt:			
Mine output, metal content of concentrate e	r 4,300	r 3,840	2,970
Metal	2,664	2,379	e 1,838
Copper:			
Mine output, metal content of concentrate	706,574	697,956	676,921
Blister and anodes, copper content [1]	r 688,576	709,263	659,028
Refined	638,509	676,854	629,150
Gold [2] troy ounces	8,500	8,500	8,500
Iron ore, magnetite	--	420	223
Lead:			
Mine output, lead content of ore	37,000	35,700	26,100
Metal, refined	r 25,400	24,700	18,900
Silver [3] thousand troy ounces	1,200	1,100	1,000
Tin, concentrate, gross weight	8	11	e 10
Zinc:			
Mine output, zinc content of ore	73,200	80,500	66,600
Smelter and electrolytic	53,355	58,338	46,923
NONMETALS			
Cement (hydraulic) thousand tons	412	e 380	e 380
Feldspar	12	1,777	1,174
Fluorspar	7	460	e 500
Gem stones:			
Amethyst kilograms	91,500	37,425	32,000
Beryl do	--	11	NA
Gypsum	480	3,771	7,536
Lime, hydraulic and quick e thousand tons	110	110	110
Stone:			
Limestone do	978	840	755
Phyllite do	75	NA	NA
Sulfur	r 76,546	79,220	e 78,800
Talc	1,750	138	e 100
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous thousand tons	r 810	707	898

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

1 Includes leach cathodes.

2 Chiefly contained in blister copper, and refinery muds.

3 Refined silver and silver contained in blister copper, and refinery muds.

Table 2.—Zambia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum including alloys, all forms	763	68	Mainly to Republic of South Africa.
Cadmium metal, unwrought	6	--	
Cobalt metal, unwrought	1,145	1,894	United Kingdom 1,773.
Copper:			
Copper bearing residues	1,449	1,428	Belgium-Luxembourg 536; Sweden 317; Japan 288.
Metal:			
Unwrought:			
Unrefined blister	43,071	35,570	Yugoslavia 11,500; United Kingdom 9,850; Japan 6,663.
Refined:			
Wire bar	521,259	520,095	United Kingdom 121,164; Japan 97,348; Italy 75,223.
Cathode	104,206	116,304	Japan 33,469; West Germany 31,965; United Kingdom 21,871.
Total	625,465	636,399	
Semimanufactures	66	(1)	All to United Kingdom.
Iron and steel, metal:			
Scrap	r 10	10	Mainly to Kenya.
Semimanufactures including ferro-alloys	r 94	432	Zaire 177; Republic of South Africa 127; Tanzania 60.
Lead:			
Oxide	73	82	Zaire 47; Kenya 25; Cyprus 10.
Scrap	--	872	Republic of South Africa 499; Italy 339.
Unwrought and semimanufactures	20,012	18,776	Italy 7,200; Republic of South Africa 3,951; Yugoslavia 3,901.
Platinum-group metals and silver:			
Metal including alloys --troy ounces	1,398	996	All to United Kingdom.
Tin ore and concentrate	--	20	Do.
Zinc metal:			
Scrap	179	49	All to Republic of South Africa.
Unwrought	51,115	50,227	Yugoslavia 17,625; Italy 9,285; Kenya 4,647.
Other, base metals, including alloys, all forms, n.e.s	13	--	
NONMETALS			
Abrasives:			
Pumice, emery, natural corundum, etc	--	(1)	All to Italy.
Cement	282	5,218	Tanzania 5,000.
Chalk	r (1)	(1)	All to Zaire.
Fertilizer materials, nitrogenous	300	687	Zaire 506; Kenya 181.
Lime	514	36	All to Zaire.
Mica, all forms --kilograms	--	104	All to India.
Precious and semiprecious stones, except diamond --value, thousands	r $1,849	$580	West Germany $221; Hong Kong $135.
Stone, sand and gravel:			
Stone, crushed and broken	13,108	13,744	All to Zaire.
Sand, not metal bearing	15	--	
Talc	767	345	Republic of South Africa 315.
Other slag, dross, and similar waste, not metal bearing	r 2	--	
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon	--	2	All to Seychelles.
Coal, all grades, including briquets	--	23,020	Zaire 23,000.
Petroleum:			
Partly refined --42-gallon barrels	2	--	
Refinery products:			
Gasoline --do	r 967	11	All to Tanzania.
Kerosine --do	r 5	24	All to Zaire.
Distillate --do	r 403	--	
Lubricants --do	r 316	204	Zaire 132; Kenya 66.
Bituminous mixtures --do	r 1,747	315	Zaire 286; Malawi 29.
Other --do	(1)	--	
Total --do	r 3,438	554	
Mineral tar and other coal-, petroleum- or gas-derived crude chemicals	7	--	

r Revised.
1 Less than ½ unit.

Table 3.—Zambia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum metal:			
Scrap	--	2	All from Republic of South Africa.
Unwrought and semimanufactures	769	703	United Kingdom 287; Tanzania 168; Republic of South Africa 72.
Antimony:			
Ore and concentrate	8	17	Mainly from People's Republic of China.
Powder	120	30	Mainly from Republic of South Africa.
Arsenic trioxide, pentoxide, acids	--	17	France 8; Japan 7.
Chromium:			
Chromite	3	1	All from Republic of South Africa.
Oxide and polishing	--	7	United Kingdom 6.
Metal including alloys, all forms	112	3	Mainly from United Kingdom.
Cobalt metal including alloys, all forms	(1)	(1)	All from United Kingdom.
Copper:			
Copper sulfate	159	110	Republic of South Africa 85; United Kingdom 25.
Metal including alloys, all forms	438	426	United Kingdom 126; Italy 119; Zaire 98.
Iron and steel:			
Ore and concentrate, except roasted pyrite	78	40	Republic of South Africa 39.
Roasted pyrite	120	--	
Metal:			
Scrap	5,803	2,164	Mainly from United Kingdom.
Pig iron, ferroalloys, similar materials	1,113	1,914	Republic of South Africa 756; United Kingdom 572; Japan 450.
Steel, primary forms	2,504	527	Hong Kong 483; Italy 40.
Semimanufactures	86,812	169,075	Japan 87,704; Belgium-Luxembourg 16,899; United Kingdom 16,694.
Lead:			
Oxides	28	1	Mainly from United Kingdom.
Metal including alloys, all forms	r 33	33	Belgium-Luxembourg 11; United Kingdom 10; People's Republic of China 8.
Manganese oxide	(1)	247	Republic of South Africa 236.
Nickel metal including alloys, all forms	10	15	Mainly from Republic of South Africa and United Kingdom.
Platinum-group metals including alloys, all forms troy ounces	722	2,715	United Kingdom 2,630.
Silver metal including alloys do	3,289	1,890	West Germany 1,120; United Kingdom 736.
Tin metal including alloys, all forms	88	37	Italy 28; United Kingdom 4.
Titanium oxides	140	139	United Kingdom 91; West Germany 47.
Zinc:			
Oxide	150	254	United Kingdom 172; West Germany 77.
Metal including alloys, all forms	3	7	United Kingdom 4; West Germany 2.
Other:			
Ore and concentrate	1	(1)	Mainly from United States.
Ash and residue containing nonferrous metals	6	--	
Metals including alloys, all forms, n.e.s	189	77	People's Republic of China 42; United Kingdom 33.
Oxides, hydroxides and peroxides of metals, n.e.s	(1)	(1)	Mainly from West Germany.
NONMETALS			
Abrasives:			
Pumice, emery, natural corundum, etc	(1)	23	All from United States.
Grinding and polishing wheels and stones	63	156	United Kingdom 104; Republic of South Africa 35; Italy 19.
Asbestos	3,322	3,017	Swaziland 1,614; Republic of South Africa 1,403.
Barite	1	83	Kenya 44; West Germany 39.
Boron:			
Crude natural borates	65	--	
Oxide and acid	(1)	(1)	Mainly from Sweden and United Kingdom.
Bromine	29	61	Mainly from Israel.
Cement	3,512	1,316	United Kingdom 1,223.
Chalk	187	204	United Kingdom 202.

See footnotes at end of table.

Table 3.—Zambia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Fire clay	20	--	
Fuller's earth	41	108	United Kingdom 100.
Kaolin	141	195	All from United Kingdom.
Other	1,959	2,480	India 1,192; United States 569; United Kingdom 475.
Products, refractory (including nonclay brick)	531	315	West Germany 194; United Kingdom 106.
Diamond, industrial carats	r 16,065	57,010	United Kingdom 54,170.
Diatomite and other infusorial earth	236	419	United States 305; Kenya 114.
Feldspar and fluorspar	10	253	West Germany 144; Kenya 109.
Fertilizer materials:			
Crude phosphatic	335	1,720	People's Republic of China 860; Australia 590.
Manufactured:			
Nitrogenous	91,505	80,426	Republic of South Africa 70,159.
Phosphatic	3,480	9,490	All from Republic of South Africa.
Potassic	979	1,420	Republic of South Africa 1,419.
Other including mixed	2	1	Mainly from United Kingdom.
Ammonia	2	34	Israel 18; West Germany 9; United Kingdom 6.
Graphite, natural	1	2	Mainly from Republic of South Africa.
Gypsum and plasters	926	208	United Kingdom 107; Yugoslavia 94.
Magnesite	17	2	All from United Kingdom.
Mica, all forms	9	1	Mainly from United States.
Pigments, mineral, including processed iron oxides	147	287	United Kingdom 161; India 53; West Germany 50.
Precious and semiprecious stones, diamond value, thousands	$26	$14	Zaire $7; West Germany $4.
Salt	33,987	12,124	Angola 5,130; United Kingdom 3,957; Mozambique 1,975.
Sodium and potassium compounds:			
Caustic soda	2,623	2,835	West Germany 756; Italy 540; Switzerland 420.
Caustic potash	13	41	West Germany 25; Belgium-Luxembourg 15.
Soda ash	636	2,588	Kenya 2,510.
Stone, sand and gravel:			
Stone:			
Dimension stone	9	28	Italy 27.
Dolomite	270	1	All from United Kingdom.
Gravel and crushed rock	265	96	Tanzania 89; United States 5.
Limestone (except dimension)	1,838	--	
Quartz and quartzite	r 6	6	All from United Kingdom.
Sand, excluding metal bearing	57	9	United Kingdom 8.
Sulfur:			
Elemental, all forms	15,427	3,154	Canada 3,099.
Sulfuric acid	1,139	285	West Germany 142; Tanzania 61.
Talc and steatite	74	22	India 21.
Other nonmetals, n.e.s.:			
Crude	2	(1)	All from United Kingdom.
Slag, dross and similar waste not metal bearing	104	15	United States 14.
Oxides and hydroxides of magnesium, strontium and barium	r 2	1	Mainly from Switzerland and United Kingdom.
Building materials of asphalt, asbestos, and fiber cement and unfired nonmetals	371	257	United Kingdom 86; Republic of South Africa 84; Austria 41.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	753	1,130	United Kingdom 602; Kenya 228.
Coal and coke including briquets	60,462	93,936	West Germany 93,899.
Petroleum:			
Crude and partly refined thousands 42-gallon barrels	4,811	6,183	Saudi Arabia 4,877; Iran 934.
Refinery products:			
Gasoline do	670	25	Iran 24.
Kerosine do	68	16	Iran 14.
Jet fuel do	35	--	
Distillate fuel oil do	1,019	2	Mainly from Iran.

See footnotes at end of table.

Table 3.—Zambia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Residual fuel oil thousand 42-gallon barrels	r 30	--	
Lubricants do	r 203	308	United Kingdom 149; Italy 61; Kenya 59.
Other:			
Mineral jelly and wax do	27	29	People's Republic of China 13; United States 6.
Unspecified do	r 27	8	Kenya 4; United Kingdom 3.
Total do	r 2,079	388	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	89	72	Sweden 40; United Kingdom 22.

r Revised.
[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Copper and Byproduct Cobalt.—Mine production of copper decreased 3% from 697,956 tons in 1974 to 676,921 tons in 1975, but because of price declines the value of copper exported declined 44% from $1,308 to $729 million for the same periods.

During their fiscal year which ended June 30, 1975, RCM produced 288,564 tons of copper and reported sales of 289,747 tons, increasing by 3% and 4%, respectively, the figures reported for 1974. The average sale price was $1,423 per ton, a decrease of 63% from the average of $2,253 realized in fiscal 1974. The Mufulira underground operation continued as RCM's largest producer, contributing 44% of RCM's production. Development work continued at the Baluba ore body which produced about one-sixth of the 6.4 million tons of ore treated at the Luanshya concentrator. The remainder came from the lower levels and western extension of the Roan Antelope ore body where bad ground was responsible for dilution resulting in a concentrator head grade of 1.47% copper. Sulfuric acid production diminished to 12,718 tons because of reduced demands from the mining industry. A plant to pulverize coal from the Maamba Colliery was under construction at Luanshya.

Ore production at the Chambishi open pit was halted for more than 4 months to accelerate overburden stripping during the dry season, and trackless methods were used for underground mining down dip from the pit bottom. Equipping of the 1,000-meter shaft on the footwall of the pit continued. The Chambishi roast-leach plant produced 523 tons of cobalt contained in hydroxide recovered from cobaltiferous concentrate from Baluba and Chibuluma. Plans for producing cobalt metal instead of hydroxide were implemented. Shaft sinking was continued at the Chibuluma West ore body and production came from both the main and western ore bodies. Plans for shaft sinking at the Kalulushi East deposit were postponed. RCM continued construction of a plant at Ndola for the recovery of copper, selenium, and precious metals from refinery tankhouse slimes which were previously treated abroad. Completion was scheduled for April 1976.

The following tabulation shows ore produced and ore reserves at RCM mining properties:

Mine	Ore produced		Ore reserves	
	Thousand tons	Percent copper	Thousand tons	Percent copper
Mufulira	6,930	2.21	143,932	3.15
Luanshya	6,420	1.47	136,501	2.56
Chambishi pit	1,120	2.19	42,309	2.91
Chambishi U/G	511	2.43		
Chibuluma	646	3.25	8,414	4.58
Kalengwa	208	5.90	978	6.95
Kalulushi East	--	--	5,900	4.09
Total	15,835	2.01	338,034	2.96

Total copper production from mines operated by NCCM during its 1975 fiscal year included 381,714 tons of refined copper and 26,952 tons of blister copper. The Nchanga operation included open pit and underground mines and, as NCCM's largest producer, reported 274,000 tons of copper. The Chingola low-grade tailings leach plant experienced low copper recovery rates after more than a year of operation, and expansion was deferred. The open pit mine and oxide treatment plant at the Mindola section of the Nkana ore body ceased operations at yearend. Expansion of the Mindola underground mine continued and Mindola ore was treated at the Rokana concentrator-smelter-refinery complex. At Konkola, production dropped 5% to 52,609 tons of copper. Drainage remained a major problem and water was pumped at an average rate of 91 million gallons per day (345,110 cubic meters per day). The Nampundwe pyrite mine west of Lusaka produced about 58,000 tons of concentrate containing 2.48% copper and 41% sulfur. The concentrate was stockpiled at the mine pending depletion of a stockpile at the Nkana complex which contributed to the production of sulfuric acid and copper. The Nkana cobalt plant recovered 1,578 tons of cobalt metal and shipped byproduct gypsum to Chilanga Cement Limited at a rate of more than 2,000 tons per month.

Ore production and ore reserves for mines operated by NCCM are tabulated below:

Mine	Ore produced		Ore reserves	
	Thousand tons	Percent copper	Thousand tons	Percent copper
Nchanga	9,786	3.40	252,280	3.42
Rokana	5,471	1.66	119,943	2.44
Konkola	1,773	2.96	125,093	3.55
Bwana Mkubwa	1,095	2.75	3,187	3.53
Total	18,125	2.79	500,503	3.22

Kansanshi mine, 160 kilometers west of the copperbelt, was the site of ancient workings before its "discovery" in 1899, and was operated intermittently until 1957. Construction of an oxide treatment plant and housing for staff to start an open pit operation was halted in 1975.

Excessive water hampered operations of the Romanian-managed Mokambo mine near the Zaire border north of Mufulira. The Mkushi mine, 130 kilometers southeast of the copperbelt, and the Chifumpa mine 240 kilometers to the southwest, ceased operations.

Table 4 shows exports of copper by country for 1974 and 1975.

Lead, Zinc, and Byproduct Silver.—The Broken Hill Division of NCCM produced 380,000 tons of galena-sphalerite ore from the Broken Hill mine at Kabwe, 110 kilometers north of Lusaka. Recovery of metals from the recently-installed Waelz kilns was lower than anticipated, but 18,900 tons of lead, 20,680 tons of high-purity zinc, 26,243 tons of plus 98.5% zinc, 13,345 tons of sulfuric acid, 7,150 kilograms of cadmium, and 276,560 troy ounces of silver were produced.

NONMETALS

The Chilanga Cement Co. operated quarries and cement kilns 30 kilometers south of Lusaka, and the Ndola Lime Co. Ltd. produced lime and crushed stone for flux and aggregate from quarries east of Ndola.

Table 4.—Zambia: Exports of copper by country
(Metric tons)

Country	1974		1975	
	Blister	Refined	Blister	Refined
Austria	--	3,511	--	3,676
Belgium	500	10,884	--	13,701
Brazil	--	27,136	--	16,434
China, People's Republic of	--	17,996	--	17,479
Denmark	--	2,149	--	2,579
Finland	--	1,500	--	1,379
France	750	63,033	--	63,558
Germany, West	407	91,500	--	100,550
Greece	--	5,545	2,427	5,462
India	--	20,514	--	7,575
Italy	--	78,636	--	79,320
Japan	6,663	130,817	199	113,644
Netherlands	--	4,914	--	5,815
Portugal	1,500	--	1,271	--
Spain	2,200	6,104	1,021	3,246
Sweden	--	8,008	--	14,712
Switzerland	200	10,649	--	10,525
United Kingdom	9,850	143,035	11,612	132,752
United States	2,000	729	--	5
Yugoslavia	11,500	8,967	2,492	18,036
Other	--	772	--	5,610
Total	35,570	636,399	19,022	616,058

Sources: 1974—Official trade returns of Zambia; 1975—World Bureau of Metal Statistics. World Metal Statistics, August 1976, p. 66.

Amethyst was produced by Northern Minerals Ltd. from several open pit mines in the Zambezi scarp area, 135 kilometers northeast of Livingstone. Amethyst production declined 14% from 37,425 kilograms in 1974 to 32,000 kilograms in 1975. The mineral was recovered from vein swarms cutting schistose rock. The weathered rock was ripped, loaded, and hauled to a central washing plant where it was washed free from clay in trommels, handpicked, and stockpiled or hauled 400 kilometers to Lusaka. It was there wet-cobbed, graded, and sacked for export or sold to a local manufacturer for cutting and polishing. Foreign exchange earnings exceeded $1 million per year and most of the production was shipped to Hong Kong and West Germany.

Feldspar and fluorspar were produced by the Government-operated Mines Development Corp. (Mindeco) from a deposit 20 kilometers northwest of the Kariba Dam. The rock was sorted and hauled to the glass factory near Kipiri Mposhi where quartzite was quarried for the silica.

In March 1975, the Kalulushi brick factory commenced operations 8 kilometers northwest of Kalulushi township, where staff housing was nearing completion. The 130 million-units-per-year plant cost about $23 million and was part of Zambia Clay Industries Ltd.'s plan to provide construction material near expanding industrial centers throughout the country. In April, the 70 million-units-per-year Nega Nega brick factory was started some 60 kilometers southwest of Lusaka. Completion of two additional plants was scheduled for 1978.

MINERAL FUELS

The Indeni Petroleum Refining Co. Ltd. imported 8,858,000 barrels of crude oil via the Tanzam pipeline to the refinery at Ndola, from which most of Zambia's petroleum requirements were supplied. Ammonium nitrate-fuel oil explosives were manufactured at Kafironda near the Kafue River southwest of Mufulira. Heavy fuel oil supplemented coal in metallurgical operations at copperbelt smelters. In 1975, a pipeline was planned to carry diesel fuel to Lubumbashi for Zaire's mining industry. Lack of finance caused postponement of the project.

Maamba Collieries Ltd. produced 898,154 tons of coal from an open pit mine at the foot of the Zambezi scarp, 240 kilometers southwest of Lusaka. The coal was washed in a heavy-media separation plant at the mine, and transported to storage and loading facilities at Batoka. Railway cars transported it to consumers at Chilanga, Lusaka, the copperbelt, and to storage silos along the line of rail.

The Mineral Industry of Other Areas of Africa

By Staff, Bureau of Mines

CONTENTS

BOTSWANA [1]

The mineral industry of Botswana contributed approximately \$72 million[2] to the nation's gross domestic product (GDP) in 1975, compared with \$73 million (at current prices) in 1974. Mine production included nickel-copper matte, valued at \$30.3 million; coal, valued at \$876,000; diamond, valued at \$40.4 million; and semiprecious stones, valued at \$29,000.[3] The rand was devalued 18% in September 1975, making the financing of imports increasingly difficult. Botswana experienced an annual inflation rate of about 15%, owing to heavy dependence on external sources of fuel and other goods. Imported petroleum products were valued at approximately \$3.8 million in 1975.

Botswana became a beneficiary of the U.S. Generalized System of Preferences (GSP) trade act, to be implemented January 1, 1976. With the addition of products from the GSP list, a total of 97.5% of Botswana's exports to the United States was to be duty-free. The main Botswana exports to benefit from GSP will be materials containing over 10% copper, lead, or zinc. On February 28, 1975, Botswana also became a member of the Lomé Convention,

[1] Prepared by Janice L. W. Jolly, physical scientist, International Data and Analysis.

[2] Where necessary, values have been converted from South African rand (R) to U.S. dollars at the rate of R1=US\$1.3663.

[3] Central Statistics Office, Ministry of Finance and Development Planning, Gaborone, Botswana. Statistical Bulletin, v. 1, No. 1, June 1976, p. 7, table 8.

establishing financial and industrial cooperation with the European Economic Community (EEC).

A $16 million loan from the Canadian International Development Authority (CIDA) was granted to finance an aeromagnetic survey of the Kgalagadi District. The survey was expected to reveal the disposition of major sedimentary basins and subsurface rocks and aid in economic evaluation of the area. The African Development Bank (ADB) allotted about $6 million for construction of the 48-kilometer Lobaste to Kanye road, and the International Bank for Reconstruction and Development (IBRD) granted $5.8 million for a tarred road between Molepolole and Gaborone as well as other smaller projects related to infrastructure development. A U.S. organization was to establish a vocational training center Opportunities Industrialization Centre International (OICI), in Gaborone for teaching industrial skills relevant to development needs.

With the increase in gold prices on world markets, there was renewed interest in the gold deposits occurring in the Archean greenstone belts of the Rhodesian Craton in northeastern Botswana. The only production has been from the Tati schist belt where peak gold production reached 600,000 grams in 1938. Output ceased in 1964. Silver was a minor byproduct. There were over 60 abandoned mines southeast of Francistown; some constituted promising prospects. The Bonanza mine was estimated to have indicated reserves of 70,000 tons grading 41.5 grams of gold per ton. The Rainbow and New Zealand mines were estimated to contain 20,000 tons with 10 grams of gold per ton. The Map-Nora mines had reserves indicated at 150,000 tons with 17 grams of gold per ton. Most were quartz veins or reefs except the Golden Eagle mine, where disseminated ore in a structurally disturbed area contained estimated reserves of 10,000 tons grading 10 grams of gold per ton.[4]

The Otse manganese deposit, associated with conglomerates and chert breccias at the base of the Transvaal sequence, was under reinvestigation, but reserves were not yet delineated. Known occurrences also include Kgwakgwe, which was formerly a producing mine situated south of Kanye within rocks of the Transvaal Supergroup. The mineralization was confined to a shale horizon with an upper zone about 2 meters thick composed of metallurgical-grade ore and a lower layer composed of massive accumulation of manganese nodules with a grade in excess of 70% MnO_2. High-grade material has been almost worked out, but over 200,000 tons of metallurgical-grade ore was estimated to remain. The Lobatse and Ramotswa manganese deposits occurred in the Pretoria group, forming a continuation of the small deposits from the South African side of the Botswana border. The size of reserves was unknown but was thought to be small. At Chadibe and Tswapong, the Waterberg succession overlying the Limpopo belt rocks contained a persistent manganiferous sandstone horizon, rarely more than 2 meters thick, but with a total strike length of 45 kilometers. No systematic exploration had been undertaken, but grades ranged from 30% to 60% MnO_2.

By yearend 1975, the Selebi-Pikwe copper-nickel mine operated by Bamangwato Concessions Ltd. (BCL) had started to make progress on the technical and production problems that had beset them in 1974. Production had risen from 1,027 tons of copper-nickel matte in January to 2,403 tons in December 1975. A total of 16,513 tons of copper-nickel matte (39% nickel and 39.3% copper) was produced in 1975, valued at $30.3 million, compared with 6,663 tons in 1974. The year was not without problems, however, as the smelter was closed for 5 weeks in March for overhaul while production continued at a lower rate from two electric furnaces using materials mainly accumulated last year when operations were interrupted. A strike by the 2,700 mine workers also halted production temporarily in August. The strike was a demand for a uniform wage increase rather than the system of merit increases agreed upon between unions, management, and government in 1974. Even so, the mine reportedly came near to breaking even on an operating basis. When allowing for interest on loans totaling $262 million, however, a loss of $47.3 million was recorded. Progress continued to be made in discussions regarding financial restructuring with the principal lenders, including the World Bank, German banks, the South African Indus-

[4] Baldock, J. W., J. V. Hepworth, and B. S. Marengwa. Gold, Base Metals, and Diamonds in Botswana, Econ. Geol., v. 71, No. 1, January–February 1976, pp. 139–156.

trial Development Corp., American Metal Climax, Inc. (Amax), and Anglo-American Corp. A major refinancing program was considered vital for the mine's future. New management was also called in at yearend, and continuing research by BCL was being directed to solution of problems in the concentrator circuit and the final treatment of the concentrates prior to smelting.

Pikwe had 22.1 million tons proved reserves (including open pit reserves to 140 meters depth, 4.0 million tons with 0.84% nickel and 0.83% copper) with an average grade 1.45% nickel and 1.14% copper and 9 million tons probable reserves containing an average 1.13% nickel and 1.09% copper. Selebi had 10 million tons proved reserves containing 0.70% nickel and 1.56% copper with 2.6 million tons probable reserves of 0.88% nickel and 1.28% copper. Selebi North had 1.9 million tons probable reserves with 0.86% nickel and 0.97 copper.[5] The two major ore bodies are genetically related to the main host amphibolite in a succession of strongly refolded paragneisses, anorthositic gneisses, and amphibolites in the Limpopo mobile belt. Other similar mineral occurrences were known at Dikoloti and Lentswe, but their economic potential had not yet been determined.

Nickel-copper mineralization in the Tati schist belt comprised two medium-sized ore bodies near Francistown and a small satellite occurrence. One of these, the Phoenix deposit, is composed of massive veinlike bodies impersistently developed within shear zones. Disseminated sulfides also occur in the associated amphibolites and some of the migmatites, but are of little economic importance. Two sets of larger, steeply plunging ore shoots occur at the center of the Phoenix deposit, containing nickeliferous pyrrhotite, pentlandite, chalcopyrite, and minor pyrite. The nickel-to-copper ratio is higher in the Phoenix deposit than in other deposits in Botswana. Reserves were estimated to be 4.5 million tons grading 2.1% nickel and 0.8% copper. Located near the Phoenix is the Selkirk deposit, which consists of a massive sulfide core concentrated in the nose and along the axis of a syncline and surrounded by disseminated ore in the layered metaoctolite host. The massive ore pinches out at depth, but the disseminated ore persists down dip and was presumed to be subeconomic. Reserves of 3 million tons with about 0.9% nickel and 0.8% copper were estimated. Tekwane is a small nickel-copper deposit near and similar to Selkirk. Indicated reserves were 600,000 tons averaging 1.2% nickel and 0.6% copper.

The Morupule colliery, established mainly to serve the Selebi-Pikwe power stations and smelter, was starting to supply the Gaborone power station and the Botswana Meat Commission in Lobatse as steps to convert to coal were being taken. The importance of this shift to self-sufficiency was heightened by increasing prices for imported coal (from Rhodesia) and by escalating energy costs caused by the increase in price of imported diesel fuel. Conversion to Botswana coal was well advanced at the Gaborone power station. Coal production for 1975 was 71,248 tons, steadily increasing throughout the year from 1,000 tons produced in February to 11,900 tons produced in December. The production was valued at $875,798.[6]

Plans for further development of Botswana's diamond resources were agreed upon in 1975 between the Government and De Beers Consolidated Mines, the two shareholders in De Beers Botswana Mining Co. (Pty.) Ltd. (Debswana). Under terms of that agreement the Government acquired equal representation on Debswana's board and increased the Government's share from 15% to 50%. A new royalty and profits tax system was also agreed upon in which the taxation level may vary depending on the profitability. The 10% profits tax was scrapped, but the normal income tax and withholding taxes still applied. As a partner in the industry, the Government received between 65% and 70% of the profits through royalties, taxes, and dividends. Debswana was planning to double the production at the Orapa mine to 4.5 million carats per year in 1979. The Letlhakane mine (Dk ½ pipes) was also to start production by early 1977 at a rate of 300,000 carats per year, rising to 400,000 carats per year by 1980. Gravels surrounding the pipes at Letlhakane were to be mined in the first development stage at a capital cost of about $16.4 million. The concentrated and screened gravels were to be sent to

[5] Baldock, J. W., J. V. Hepworth, and B. S. Marengwa. Gold, Base Metals and Diamonds in Botswana. Econ. Geol., v. 71, No. 1, January–February 1976, pp. 139–156.

[6] Ministry of Finance and Development Planning, Gaborone, Botswana. Statistical Bulletin. V. 1, No. 1, June 1976, p. 8.

Orapa for final recovery. The second development stage would involve establishing a crushing plant for the kimberlite and would cost another $13.7 million, raising the production to 400,000 carats per year.

Production at the Orapa mine fell by 300,000 carats to 2.4 million carats for 1975. Although revenues were higher per carat than expected, higher operating costs resulted in an overall drop in profits. The main focus of De Beer's prospecting in 1975 was a kimberlite labeled 2125 B/K9 where stripping of overburden continued. Heavy rains hindered progress. Core drilling, sample pitting, and ground geophysical traversing continued around several other kimberlites to the west of Orapa. An airborne magnetic survey was carried out to the west of Mopipi at yearend. The discovery of a new kimberlite field was reported in the Jwaneng area, located 90 kilometers northwest of Kanye.

Diamonds were sorted and valued in London before 1974. Since then, preliminary sorting has been carried out in Gaborone by the Botswana Diamond Valuing Co., a joint venture between the Botswana Development Corp. (55%) and Debswana (45%). The valuation of Debswana's production must be confirmed by a government valuation and the production is then bought by the Diamond Corp., which is a part of the Central Selling Organization (CSO) for sale to the world's cutters and dealers.

Gulf Resources and Chemical Corp. was actively considering investment in the Sua Pan soda ash project as new markets were being identified for Botswana soda ash. The Overseas Private Investment Corp. (OPIC) of the United States was to assist with the program. By November 1975, Gulf had decided to make application for a prospecting license for exclusive rights to develop the project and hoped to negotiate a mining concession before commencing investment in a pilot plant. The pilot plant construction was expected to cost about $3 million and take 2 years to complete. Gulf was hoping to attract a consortium of investors including South African, U.S., and Australian interests. The project was to have at least a 500,000-ton-per-year capacity.

Table 1.—Other Areas of Africa: Production of mineral commodities

Country, commodity, and unit of measure [1]	1973	1974	1975 [p]
BOTSWANA [2]			
Coal (not further described) ---metric tons--	15,532	32,732	71,248
Copper matte, copper content ---do----	[e] 1,400	2,380	6,490
Diamond:			
Gem [e] ---thousand carats--	362	408	362
Industrial [e] ---do----	2,054	2,310	2,052
Total ---do----	2,416	2,718	2,414
Gem stones, semiprecious, rough, not further described kilograms--	72,914	36,500	65,000
Manganese ore and concentrate, gross weight ---metric tons--	340	8	--
Nickel matte, nickel content ---do----	[e] 1,300	2,630	6,440
BURUNDI [2 3]			
Gold ---troy ounces--	157	360	368
Lime ---metric tons--	224	630	798
Rare-earth metals, bastnäsite concentrate, gross weight -do----	176	263	82
Tin ore and concentrate:			
Gross weight ---do----	141	113	80
Tin content ---do----	99	80	56
Tungsten (W content) ---do----	--	[e] 1	[e] 1
CAMEROON [2]			
Aluminum metal, primary ---do----	44,123	46,842	51,913
Cement, hydraulic ---do----	191,648	201,399	238,071
Gold, mine output, metal content ---troy ounces--	83	64	96
Stone:			
Limestone ---metric tons--	49,270	49,193	46,951
Marble ---do----	1,200	1,096	1,047
Tin ore and concentrate:			
Gross weight ---do----	36	36	35
Tin content ---do----	24	24	19

See footnotes at end of table.

Table 1.—Other Areas of Africa: Production of mineral commodities—Continued

Country, commodity, and unit of measure [1]	1973	1974	1975 [p]
CENTRAL AFRICAN REPUBLIC [2]			
Diamond:			
Gem [e] carats	251,108	200,990	202,602
Industrial [e] do	129,358	140,000	135,069
Total do	380,466	340,990	337,671
Gold troy ounces	64	64	529
CHAD [2]			
Natron:			
Slabs (plaques) metric tons	1,681	1,149	[e] 5,000
Broken do	2,400	NA	--
CONGO [2]			
Copper, mine output, metal content do	927	930	916
Fertilizer materials, potash, crude, K_2O equivalent do	269,199	288,221	280,106
Gas, natural:			
Gross production [e] million cubic feet	15,800	23,000	14,000
Marketed production do	[r] 551	664	591
Gold, mine output, metal content troy ounces [e]	1,200	700	500
Lead, mine output, metal content metric tons	1,340	1,663	1,991
Petroleum, crude thousand 42-gallon barrels	15,361	22,434	13,386
Zinc, mine output, metal content metric tons	3,495	3,366	4,461
DAHOMEY [2]			
Salt (marine) do	[e] 2,500	2,500	150
Stone, gravel do	NA	15,000	[e] 16,000
ETHIOPIA [2 4 5]			
Cement, hydraulic do	204,339	208,246	145,000
Clays, kaolin [6] do	12,570	130	50
Copper, mine output:			
Gross weight do	1,900	1,900	[e] 1,900
Metal content [e] do	130	130	130
Gold, mine output, metal content troy ounces	19,575	15,754	19,981
Gypsum and anhydrite, crude metric tons	[e] 4,500	1,666	--
Lime [6] do	11,230	6,450	[e] 6,000
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	639	597	585
Jet fuel and kerosine do	249	210	174
Distillate fuel oil do	1,388	1,395	1,246
Residual fuel oil do	1,596	1,464	1,408
Other:			
Liquefied petroleum gas do	41	40	35
Asphalt do	132	90	62
Unspecified do	--	6	65
Refinery fuel and losses do	584	483	365
Total do	4,629	4,285	3,940
Platinum, mine output, metal content troy ounces	235	230	162
Pumice metric tons	10	--	--
Salt:			
Rock thousand metric tons	[e] 10	--	--
Marine do	107	122	76
Stone, limestone metric tons	98,523	16,198	7,315
Talc do	--	3	25
GUINEA [2]			
Aluminum:			
Bauxite, gross weight thousand metric tons	3,660	7,605	[e] 9,000
Alumina do	615	636	639
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	600	630	[e] 630
Diamond:			
Gem [e] thousand carats	120	112	92
Industrial [e] do	180	167	117
Total do	300	279	209
Fertilizer materials, manufactured, mixed [e] metric tons	40,000	40,000	40,000
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	1,750	2,023	2,202
Jet fuel do	425	1,023 (jet fuel and kerosine combined)	561
Kerosine do	380		--

See footnotes at end of table.

Table 1.—Other Areas of Africa: Production of mineral commodities—Continued

Country, commodity, and unit of measure [1]	1973	1974	1975 [p]
IVORY COAST [2]—Continued			
Petroleum refinery products—Continued			
Distillate fuel oil thousand 42-gallon barrels	2,534	3,081	3,380
Residual fuel oil do	3,067	3,503	3,612
Other do	81	93	110
Refinery fuel and losses do	389	421	521
Total do	8,626	10,144	10,386
LESOTHO [2]			
Diamond:			
Gem carats	1,132	1,767	444
Industrial do	7,455	9,540	2,068
Total do	8,587	11,307	2,512
MALAGASY REPUBLIC [2]			
Abrasives, natural, garnet (industrial only) kilograms	2,600	2,800	1,751
Beryllium, beryl concentrate, industrial grade, gross weight metric tons	3	13	15
Cement, hydraulic do	69,863	61,447	58,021
Chromium, chromite concentrate, gross weight do	157,714	155,874	194,127
Clays, kaolin do	1,823	3,505	4,307
Feldspar do	1	1	1
Gem and ornamental stones:			
Agate kilograms	12,600	60,200	134,400
Amazonite do	1,500	6,800	2,300
Amethyst:			
Gem do	4	9,100	3,100
Geodes do	14,900		
Apatite (ornamental only) do	2,400	715	992
Aragonite metric tons	219	648	83
Beryl kilograms	4	2	5
Calcite (ornamental only) metric tons	--	6	317
Celestine kilograms	63,500	41,100	39,700
Chalcedony do	200	196	--
Cipoline marble metric tons	600	[7] 545	35
Citrine, gem kilograms	22	20	147
Diopside, gem do	384	--	--
Garnet:			
Gem do	62	16	9
Other ornamental do	9,000	6,300	--
Jasper do	500	34,300	11,600
Labradorite do	56,600	8,400	10,400
Opal do	NA	500	4,900
Quartz:			
Rose quartz do	165,100	300,800	42,700
Geodes do	NA	2,400	85
Other ornamental do	37,400	3,400	1,000
Rhodenite do	33,400	28,100	12,400
Tourmaline:			
Gem do	200	([8])	([8])
Other ornamental do	7,500	1,200	2,200
Gold, mine output, metal content troy ounces	71	77	158
Graphite, all grades metric tons	13,963	17,280	17,774
Mica, phlogopite:			
Block do	125	151	99
Splittings do	566	551	445
Scrap do	199	155	--
Total do	890	857	544
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	1,198	1,148	1,154
Kerosine and jet fuel do	618	600	689
Distillate fuel oil do	1,365	1,306	1,422
Residual fuel oil do	1,511	1,459	1,962
Other do	128	116	105
Refinery fuel and losses do	260	251	299
Total do	5,080	4,880	5,631
Quartz, piezoelectric kilograms	400	368	254
Salt, marine metric tons	[e] 20,000	[e] 20,000	4,605
Stone:			
Calcite, industrial do	382	1,449	--
Quartz, metallurgical do	17	105	--
Other, mineralogical samples, not further described do	922	--	--
MALAWI [2 9]			
Cement, hydraulic thousand metric tons	85	81	102
Gem and ornamental stones, agate metric tons	9	22	4

See footnotes at end of table.

Table 1.—Other Areas of Africa: Production of mineral commodities—Continued

Country, commodity, and unit of measure [1]	1973	1974	1975 [p]
MALAWI [2] [9]—Continued			
Lime [e] ---metric tons--	250	250	250
Sodalite ---do---	[e] 2,400	NA	NA
Stone, sand and gravel:			
Limestone ---do---	141,890	136,045	158,335
Shale ---do---	[e] 100,000	[e] 100,000	NA
MALI [2]			
Gold, mine output, metal content ---troy ounces--	[e] 30	--	--
Salt [e] ---metric tons--	3,000	3,000	3,000
MAURITANIA [2]			
Copper, mine output, metal content ---do---	21,277	20,079	16,203
Gypsum ---do---	1,955	8,312	12,669
Iron ore and concentrate, gross weight --thousand metric tons--	10,480	11,666	8,677
Rare-earth metals, monazite concentrate, gross weight [e] metric tons--	100	100	100
Salt, marine ---do---	[e] 5,900	5,000	[e] 5,000
MAURITIUS [2]			
Lime ---do---	[e] 6,600	4,000	7,300
Salt, marine ---do---	[e] 5,900	5,000	6,000
NIGER [2]			
Cement, hydraulic ---do---	[e] 33,000	20,500	17,635
Gypsum ---do---	[e] 1,500	[e] 2,200	1,017
Salt [e] ---do---	4,000	2,000	2,000
Stone, sand and gravel:			
Limestone, not further described ---do---	[e] 33,000	40,000	35,584
Gravel ---do---	NA	[e] 100,000	NA
Sand ---do---	NA	[e] 100,000	NA
Tin, mine output, metal content ---do---	92	78	90
Uranium concentrate, U_3O_8 content ---do---	1,118	1,318	1,535
RWANDA [2]			
Beryllium, beryl concentrate, gross weight ---do---	95	62	24
Columbium and tantalum ore and concentrate, gross weight:			
Columbite-tantalite ---do---	33	37	45
Columbite-tantalite-tin [e] ---do---	587	--	NA
Gas, natural:			
Gross ---million cubic feet--	35	35	[e] 35
Marketed ---do---	35	35	[e] 35
Gold, mine output, metal content ---troy ounces--	NA	643	425
Lithium minerals, amblygonite ---metric tons--	23	NA	NA
Tin, mine output, metal content ---do---	1,404	1,280	1,462
Tungsten, mine output, metal content ---do---	[r] 340	283	348
SENEGAL [2]			
Cement, hydraulic ---thousand metric tons--	296	332	359
Clays, fuller's earth (attapulgite) ---cubic meters--	3,727	4,810	8,217
Fertilizer materials, phosphatic:			
Crude:			
Aluminum phosphate ---thousand metric tons--	219	406	201
Calcium phosphate ---do---	1,533	1,472	1,600
Manufactured:			
Aluminum phosphate, dehydrated ---do---	64	97	38
Other [10] ---do---	5	6	8
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels--	874	851	912
Jet fuel and kerosine ---do---	805	872	897
Distillate fuel oil ---do---	1,077	985	1,043
Residual fuel oil ---do---	1,987	1,793	1,916
Other ---do---	44	31	52
Refinery fuel and losses ---do---	292	148	173
Total ---do---	5,079	4,680	4,993
Salt ---metric tons--	121,632	150,000	165,000
Stone:			
Basalt ---cubic meters--	81,500	83,929	NA
Marble (cipoline) ---do---	380	120	350
SEYCHELLES ISLANDS [2]			
Phosphate rock (including coral rock phosphate) -metric tons--	7,112	3,541	[e] 3,000
SOMALIA [2]			
Salt, marine [e] ---do---	2,000	2,000	2,000
SPANISH SAHARA [2]			
Fertilizer materials, crude phosphate rock thousand metric tons--	696	2,300	2,760

See footnotes at end of table.

Table 1.—Other Areas of Africa: Production of mineral commodities—Continued

Country, commodity, and unit of measure [1]	1973	1974	1975 [p]
SUDAN [2]			
Cement, hydraulic ---thousand metric tons--	208	300	140
Chromium, chromite concentrate, gross weight ----metric tons--	32,050	20,000	15,000
Gold, mine output, metal content ---troy ounces--	49	309	[e] 300
Gypsum and anhydrite, crude [e] ---metric tons--	20,000	30,000	15,000
Magnesite, crude [e] ---do----	100	100	100
Mica, all grades ---do----	NA	250	[e] 250
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels--	904	964	971
Jet fuel ---do----	728	344	368
Kerosine ---do----	144	248	277
Distillate fuel oil ---do----	2,576	2,641	3,232
Residual fuel oil ---do----	1,950	1,439	2,538
Other ---do----	1,787	2,197 (Other and Refinery fuel and losses combined)	404
Refinery fuel and losses ---do----	490		531
Total ---do----	8,579	7,833	8,321
Salt ---metric tons--	75,030	50,000	66,000
SWAZILAND [2 11]			
Asbestos, chrysotile ---do----	39,632	32,421	37,600
Barite ---do----	116	296	200
Clays, kaolin ---do----	1,602	2,236	2,660
Coal, bituminous ---do----	140,386	116,481	126,900
Iron ore, direct shipping, gross weight --thousand metric tons--	2,013	2,481	2,222
Stone, quarry products ---cubic meters--	46,245	41,043	40,700
Talc (pyrophyllite) ---metric tons--	126	36	--
Tin, mine output, metal content ---do----	--	(8)	(8)
TOGO [2]			
Cement, hydraulic (ground from imported clinker) ------do----	118,050	127,819	150,000
Clays for brick production ---do----	8,317	6,247	NA
Fertilizer material, phosphate rock, beneficiated product -do----	2,272	2,553	1,161
Salt ---do----	100	120	3,000
Stone, sand and gravel:			
Marble:			
Dimension stone ---do----	1,240	2,233 (Dimension stone and Broken combined)	12,896 (Dimension stone and Broken combined)
Broken ---do----	1,864		
Granite ---do----	1,098	NA	NA
Sand and gravel ---cubic meters--	51,032	144,514	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, Guinea-Bissau, 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, or 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): 1973—1,846,652; 1974—575,326; 1975—2,101,123.

[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 1/2 unit.

[9] In addition to the commodities listed, corundum and kyanite may also be produced, but output is not recorded.

[10] Products marketed under the trade names "baylifos" and "phosphal".

[11] All figures reported are sales; actual production not reported.

BURUNDI [7]

The general economy of Burundi, particularly the mineral industry, registered one of its lowest recorded levels of activity in 1975, owing to the world economic recession, trade deficit, and poor agricultural yield. Mineral production was limited to a small tonnage of bastnäsite and cassiterite concentrates. Statistical data on mineral production were not available. Sobumines, in which the Government held a 49% interest, produced 82 tons of bastnäsite at Karonge mine and an undisclosed amount of cassiterite concentrates in Muyinga Province. The United Nations Development Program (UNDP) survey team continued exploration work on the nickel deposits at Musongate and Nyabikere. The team also evaluated other nickel occurrences along a 30-kilometer mineralized zone between the town of Rutana and Mahana, in the southeastern section of Burundi. A proposed feasibility study on the exploitation of nickel deposits which was to be undertaken by the UNDP did not materialize by yearend 1975; however, a loan from the World Bank to the Burundi Government was earmarked to finance the feasibility study and to improve the Government planning process. Owing to difficulties in UNDP funding, it was anticipated that the Government would seek other financing from abroad to complete the economic feasibility study. Apparently the preliminary drilling had delineated a large tonnage of 1.5% nickel content ore, which could become a major exchange earner if exploited.

A loan of about 4.5 million obtained from the ADB was to be used for building a paved road from Bujumbbura south along Lake Tanganyika, with an extension to Nyanza Lake and to the southwestern frontier of the country. Another roadbuilding program, suggested by a group of West German engineers, was to run from Citega, south to the Mosso Valley region. This project was to be financed by the Government of Burundi. Louis Bergar Co., a U.S. firm that was doing feasibility studies on some specific highways in Burundi under a World Bank funded contract, was designated to prepare a national survey of the Burundi road transport system.

Preliminary work was planned for the future exploitation of Burundi's extensive peat reserves in the vicinity of Musongati. Small quantities of sand, gravel, and crushed stone were produced primarily for local consumption.

Finally, a UNDP survey team based in Bukodba, Tanzania, completed its study for regional development of the Kagera River Basin, which involves Burundi, Rwanda, Uganda, and Tanzania. The Burundi Government was particularly interested in this project because of the possibility of erecting a hydroelectric powerplant at the Kagera River. Such a plant would facilitate development of known nickel deposits in the country.

CAMEROON [8]

The mineral industry has traditionally been a minor factor in the economy of the Federal Republic of Cameroon, which in fiscal year 1975 balanced its budget at approximately $380 million.[9] Aluminum and cement were the foremost mineral industries and accounted for about 5% of total exports. Small amounts of limestone, gold, marble, and cassiterite were also produced. The Government continued to actively support prospecting for mineral resources, with the primary focus on offshore exploration for crude oil.

Infrastructure development was also emphasized as the Government sought funds for the provision of adequate electric power and transportation facilities. About 80% of Cameroon's energy supply was in the form of hydropower obtained from the Edea dam complex in the western part of the country. In mid-1975, the commissioning of the Bamendjin dam on the Noun River increased the capacity of the Edea plant from 200 to 240 megawatts. The Lagdo dam, which was to be constructed on the Bénoué River near Garoua with financial and tech-

[7] Prepared by E. Shekarchi, supervisory physical scientist, International Data and Analysis.

[8] Prepared by Candice Stevens, economist, International Data and Analysis.

[9] Where necessary, values have been converted from Communaute Financiere African francs (CFA) to U.S. dollars at the rate of CFAF224 = US$1.00.

nical assistance from the People's Republic of China, was to provide an additional 70 megawatts of hydropower. In 1975, Cameroon also received $230 million in aid, primarily from the Saudi Arabian Development Fund, the Kuwait Development Bank, and other Arab donors, for the Song Loulou dam project on the Sanaga River, which would have a capacity of 288 megawatts.

Cameroon's primary export center, the port of Douala, was to undergo an expansion program including extensive dredging of the port, the expansion and addition of docks, and the construction of new repair facilities. The total cost was estimated at $110 million, to be provided by an international consoritum of donors, with the major share coming from the Canadian Agency for International Development, the IBRD and the ADB. The Transcameroon Railway, which established a continuous link of about 1,250 kilometers between Douala and Ngaoundere, was completed during the year. Studies were in progress for the construction of an additional railroad linkage from Belaba to the Central African Republic and for the rehabilitation of the original rail section between Douala and Yaounde.

The production of aluminum by the Compagnie Camerounaise de l'Aluminium Péchiney-Ugine (ALUCAM) increased 11% from 46,842 tons in 1974 to 51,913 tons in 1975. The ALUCAM smelter located at Edea processed approximately 250,000 tons of alumina imported from Guinea. Output has remained below the rated capacity of 60,000 tons per year owing to problems in the supply of electricity from the Edea complex. Domestic consumption of aluminum ingot was 45% of production, with the remainder of the output exported, primarily to France.

The Société d'Études des Bauxites du Cameroun (SEBACAM) completed its feasibility study on development of bauxite deposits in the Minim Martap District southwest of Ngaoundere. Reserves were estimated at 2 billion tons averaging 43% aluminum oxide and 3.4% silica. Shareholders in SEBACAM, created in 1969 for the exploitation of the reserves, included the Cameroon Government (40%), the Bureau de Recherches Géologiques et Minières (BRGM) (25%), Péchiney Ugine Kuhlmann (PUK) (25%), Kaiser Aluminum and Chemical Corp. (5%), and Vereinigte Aluminium Werke AG (VAW) (5%). During the year, SEBACAM actively sought financial partners for the development of the bauxite deposits, which would necessitate the completion of numerous infrastructure projects. Although the deposits were situated approximately 800 kilometers via the Transcameroon Railway from the port of Douala, the railroad was not considered suitable for the transport of bauxite. Other problems included insuring an adequate supply of electric power and developing deepwater port facilities for large-scale exports.

The two cement plants operated by Cimenteries du Cameroon (CIMENCAM) had a combined output of 238,071 tons in 1975, an increase of 18% over the 1974 level of 201,399 tons. CIMENCAM completed expansion programs at both plants during the year and announced plans to further increase production capacity. Annual capacity at the Bonabéri clinker-grinding plant near Douala, which served southern Cameroon, was increased from 150,000 tons to 300,000 tons. The Fijuil cement plant near Garoua, which served northern Cameroon and Chad, underwent an expansion from 26,000 to 50,000 tons per year. Raw material for the Fijuil plant was obtained from nearby limestone deposits, where production decreased from about 49,193 tons in 1974 to 46,951 tons in 1975. Limestone reserves at Fijuil were estimated at 600,000 tons. The Bonabéri plant was supplied primarily by imports, and prospecting for limestone was ongoing in the Nkonpina area north of Douala and Ngol area south of Nkongsamba. Extensive deposits of pozzolan in the southwest coastal area were also being mined for use in the manufacture of hydraulic cement at Bonabéri.

Cameroon also had limited production of gold, marble, and cassiterite. Gold produced from local alluvial workings was reported at 96 troy ounces in 1975. Marble production was reported at 1,047 tons, a slight decrease from the 1974 level. Marble reserves at the Bidzar deposits in the northern part of the country were estimated at 2.5 million tons. Cassiterite production from the deposits at Mayo Darlé near the Nigerian border was 35 tons of concentrates averaging 54% tin.

In 1975, the Cameroon Government signed an agreement with an Italian firm, Sacomi Impianti S.A., for the construction of a ceramics factory. The estimated cost of the project, which was to be under the supervision of the Céramique Industrielle du Cameroun (CERICAM), was $8 million. Output capacity was set at 750 square meters of tiles and 300 square meters of mosaics per day. Raw materials were to be obtained from deposits of clay and kaolin at Bamenda and Bamboutos in the northwest.

Offshore petroleum exploration remained the focal point of the Government's efforts to develop the country's mineral resources. Preliminary results were promising and efforts continued during 1975 to delineate the quantity of reserves. Oil was discovered by Essence et Lubrificant de France de Recherches et d'Exploitation des Pétroles au Cameroun (Elf-SEREPCA) in the area of Rio del Rey, but disagreement with Nigeria concerning the extension of territorial waters hindered further evaluation of the deposits. Drilling by Elf-SEREPCA in its second concession area in the Douala Basin near the seaport of Victoria indicated additional crude deposits. Oceanic Exploration Co. of West Africa intensified its drilling activity in its 7,500-square-kilometer tract off the mouth of the Sanaga River, while the Norwegian Oil Co. (NORMINOIL) indicated that it would begin seismic surveys in its Sanaga North concession area. Other exploration companies that held offshore prospecting permits but that reported no drilling activity in 1975 were Shell Camerounaise de Recherches et d'Exploitation (Shell-CAMEREX), Mobil Oil Co., and Gulf Oil Co. of Cameroon.

The construction of a petroleum refinery at Victoria, which was the subject of a protocol agreement in 1973 between the Cameroon Government and the Compagnie Française des Pétroles (CFP), was deferred until more definite results were obtained from ongoing exploration. Pending the development of domestic crude reserves, Cameroon would continue to import refined petroleum products. Domestic consumption was estimated at 2.3 million barrels of petroleum products per year, over half of which was supplied by Gabon.

Exploration for several other minerals was also scheduled in Cameroon in 1975. Utah Development Co. signed a 2-year contract providing for further evaluation of radioactive mineralization cited in the northern Poli District. BRGM planned a more comprehensive study of copper mineralization in the area between Bibemi and Maroua in the northernmost part of the country. In addition, the UNDP in conjunction with the Canadian Agency for International Development outlined the next steps in their ongoing mineral exploration program in Cameroon. The first phase, which cost approximately $450,000, included aeromagnetic and photogeologic studies completed in 1975. In the second phase, certain promising areas were to undergo more intensive study. These included copper, manganese, and magnetite deposits in the Nza region, hematite deposits in the northwestern Ndop area and at Kribi, manganese in the south, diamond at Batouri and Bétaré-Oya, sand deposits on Manoka Island, and corundum and sapphire in the Mamfe area.

CAPE VERDE ISLANDS [10]

The Republic of Cape Verde, an archipelago of 10 volcanic islands located about 500 kilometers from the African coast west of Dakar, gained independence from Portugal in July 1975. No mineral industry activity was reported, although unexploited deposits of phosphates and gypsum were known. Neveril Enterprises began construction on a 6-million-ton-per-year oil refinery and chemical plant in 1975 on San Vicente Island. No oil exploration activity was reported during the year.

In 1975, Portugal provided over $18 million in aid, much of it paid to farmers for work on antidrought measures. The Cape Verde Islands Government planned the development of small industries to aid economic stability.

[10] Prepared by David E. Morse, physical scientist, International Data and Analysis.

CENTRAL AFRICAN REPUBLIC [11]

Diamond and gold were the principal mineral products of Central African Republic, and exports of these commodities continued to be a major and growing source of the country's foreign exchange. Diamond production decreased 1% in 1975 compared with 1974 output, although the total value of both gem and industrial diamonds increased. As a byproduct of diamond mining, an estimated 530 troy ounces of gold was produced in 1975.

A document was published by the Ministry of Plans, International Cooperation and Statistics, which outlined development priorities of the Central African Republic. The document was prepared for presentation to the members of the European Development Fund (EDF), who visited the Central African Republic in March 1975. According to this document, the primary objectives of the Central African Republic Government were the following: To improve internal and external transport systems with emphasis on the nation's access to the sea, rivers, air, and neighboring railroads; to develop the nation's agricultural and mineral resources; and to assure its citizens a higher standard of living. In the implementation of various proposals, the Central African Republic Government would rely heavily on EDF, and, as in the past, expect EDF not only to finance but also take on technical responsibilities.

COMMODITY REVIEW

Diamond.—At yearend 1975, the future of Société Centrafricaine d'Exploitation Diamantifere (SCED) remained undecided. SCED was formed in 1972 for the expansion of diamond mining in the country with ownership divided between the Central African Republic Government (20%), Diamond Distributors, Inc. (20%), and Cominco Ltd. (60%). Cominco was to invest $8 million in the exploration for and development of diamond mines at N'Zaku and Becherati. Because no true kimberlite had been discovered in the Central African Republic and diamond production was primarily from the alluvial deposits and river basins, large-scale mining operations were uneconomical. Many thousands of small mine operators sold diamonds to collectors who were in a position to export them. The quality of the diamonds in the Central African Republic was very high; 60% to 70% were gem stones and the remainder were industrial.

Petroleum.—Shell and the Continental Oil Co. (CONOCO) of the United States conducted a series of seismological oil tests in northeastern Central African Republic in 1975. Preliminary results were encouraging; however, no test wells were drilled by yearend 1975.

Uranium.—In June 1975, the Central African Republic Government and the French Atomic Energy Commission joined Swiss Aluminium Ltd. (Alusuisse) in forming a local company, Société d'Uranium Centrafricaine, in order to exploit the uranium deposits at Bakouma. The Bakouma deposits were estimated to contain 20,000 tons of uranium reserves. Owing to the high phosphorus content, Alusuisse started a feasibility study on methods for separation and beneficiation of the ore. Also, Alusuisse concluded that for the first stage of the mining operation, owing to transportation difficulties, most of the machinery and personnel would have to be airlifted. This would increase mining costs and lengthen the time before commercial production could begin.

Other.—A magnetic anomaly, the first of its kind to be discovered from a satellite, was found by the U.S. Geological Survey to exist in the Central African Republic. At yearend 1975, the nature of the anomaly, with its associated minerals, was to be studied by UNDP scientists and the members of the Office de la Recherche Scientifique et Technique Outermer of France.

CHAD [12]

The mineral industry of Chad is very small and the only mineral exported was natron (hydrous sodium carbonate, equivalent to trona). It was mined in blocks weighing up to 35 kilograms from saliferous basins northwest of Bol, near Lake

[11] Prepared by E. Shekarchi.
[12] Prepared by David E. Morse.

Chad. Its uses included animal and human consumption, preservation of meat and hide, and soap manufacture. Based on a reported nearly 2,500 tons for the first half of the year, the 1975 annual production was estimated at 5,000 tons. This 6 month's production was greater than the total produced in 1974, indicating depletion of stockpiles. Clays (used at the N'Djamena brickyard), salt, sand, and gravel for local consumption were the only other minerals mined in 1975.

The Continental Oil Co. of Chad (CONOCO—Tchad), had been exploring for oil in Chad since 1969. CONOCO—Tchad's preliminary discoveries of a small show in the Kanem prefecture northeast of Lake Chad had been sufficiently encouraging so that the head of state, General Malloum, forecast the construction of a small petroleum refinery. This would have some effect on Chad's trade deficit since all the petroleum products used in the country have been imported. CONOCO—Tchad continued petroleum exploration near Doba in the south and in the Kanem area.

Chad's transportation system was inadequate for the needs of economic development. The road system had about 290 kilometers of paved roads that were in constant need of repair from the ravages of heavy seasonal rains and overuse by heavy trucks. Chad had no rail transport, and surface contact with the outside world was generally through Cameroon and Nigeria. Imports generally moved by air to N'Djamena, which has a good airport.

In April 1975, the military assumed control of the Government. There was no indication that there would be changes in the Government's position towards mining and petroleum ventures.

Production data for Chad is shown in table 1.

CONGO [13]

The mineral sector continued to be a major contributor to the economy of the Congo in 1975, when petroleum surpassed lumber as the country's foremost export commodity. A decline in petroleum production and the accompanying reduction in oil receipts, however, necessitated a revision in the country's budget from $313 million[14] to $260 million. At yearend, the French Government authorized payment to the Congolese Government by Essence et Lubrificants de France–Entreprise de Recherches et d'Activités Pétrolières (Elf-ERAP), the major oil producer in the Congo, for a shortfall of about 800,000 tons of projected crude oil production. The Congo still suffered a severe balance of payments deficit, which caused a reduction in the investment projects to be included in the country's 3-year development plan (1975–77). In 1975, the Congo also produced cement, potash, gold, and copper, lead, and zinc concentrates for export, and natural gas for local consumption.

Petroleum production in the Congo declined in 1975 owing to falling output in the two older fields, Pointe Indienne and Emeraude, and delays in bringing the new Loango Field onstream. Oil was produced by Elf-CONGO, a subsidiary of France's State-owned Elf-ERAP, and by Azienda Generale Italiani Petroli S.p.A. (AGIP), a subsidiary of Italy's Ente Nazionale Idrocarburi (ENI), which held 35% interests in each other's concessions. The Congolese Government, which held a 20% interest in the operations of both companies through the national company Hydro-Congo, commenced negotiations to increase its participation during the year.

Crude output at Pointe Indienne, the small onshore field discovered in 1957, had been declining since 1965, with production in 1975 totaling only 220 barrels per day. The Emeraude Field, situated 19 kilometers off the southern coast, evidenced a 31% decline as crude production fell from 49,000 barrels per day in 1974 to 34,000 barrels per day in 1975. Various production difficulties due to low reservoir pressures and the complex geology of the Congo's offshore oil basin limited the feasibility of reaching the early production target of 100,000 barrels per day. Although the field was estimated to have 7,000 million barrels of viscous 22° API gravity crude, it was projected that only 7% would be recovered owing to inherent technical problems.

The Loango Field, located about 48 kilometers offshore northwest of Emeraude, was due to begin production in late 1976.

[13] Prepared by Candice Stevens.
[14] Where necessary, values have been converted at the rate of CFAF224=US$1.00.

Because of the prohibitive costs of driving piles into the seabed at Loango, special drilling and production platforms to be anchored by their own deadweight were commissioned from Tecnomare of Italy. Although reserves at Loango were estimated at less than those at Emeraude, it was hoped that recovery would be facilitated by the early use of water injection and other factors. Targeted output was between 40,000 and 50,000 barrels per day. A 97-kilometer, 18-inch-diameter petroleum pipeline was to link the Loango Field with the Djeno terminal on the coast, which also handled Emeraude crude shipped by subsea pipeline.

The Congo's first petroleum refinery under construction at Pointe Noire was scheduled for startup in 1976. Construction work was by the Belgian consortium Sybetra. The refinery, which was to have a capacity of 1 million tons per year, would produce primarily fuel oil from the Congo's high viscosity crude. Because the Congo's consumption of petroleum products was less than 50,000 tons per year, the major share of production was to be exported. At yearend, the Congo was reported to be entering negotiations with Spain and Iran regarding the construction of a second refinery.

The production of natural gas at the Pointe Indienne Field began in 1965. Marketed production, approximately 590 million cubic feet, was sold to the Compagnie des Potasses du Congo (CPC) for use in the Hollé potash plant. Reserves of natural gas at the Pointe Indienne Field were estimated at 14 billion cubic feet.

Both Elf-CONGO and AGIP continued exploration in their concession areas in 1975. Elf-CONGO conducted seismic surveys in its offshore Pointe Noire Grands Fonds and Haute Mer permit areas and its onshore Loeme permit area. AGIP also did seismic work in its offshore Mandingo concession area. Four unsuccessful wildcats were drilled by AGIP and ELF. In 1975, a seismic survey option was also granted to a consortium consisting of Getty Oil Co., AGIP, Phillips Petroleum Co., and Hispanoil on the deepwater block adjacent to the Elf-CONGO Haute Mer concession area.

Potash, mined at the Hollé mine located 45 kilometers northeast of Pointe Noire, was the Congo's other important mineral product. Although it was scheduled to produce 800,000 tons of potassium chloride per year, the mine never yielded more than 475,000 tons (in 1974), and production fell to approximately 460,000 tons in 1975 (280,000 tons K_2O). Various French interests, including BRGM, Entreprise Minière et Chimique, and Elf-ERAP, owned over 75% of the CPC but were negotiating a withdrawal of shares at yearend 1975. Output was marketed by Société Commerciale des Potasses et de l'Azote, the sales branch of Entreprise Minière et Chimique, in 14 countries including the Republic of South Africa and Brazil. With financial backing from the French Aid and Cooperation Fund, studies continued regarding the exploitation of large deposits of carnallite ore upon the depletion of the sylvinite reserves at the Hollé mine.

Other mining activity was small-scale, with local gold panning at an annual rate of 500 troy ounces. In 1974, the Société Nationale des Mines de Sounda-Kakamoéka (SONAMIS) was established as a joint venture between the U.S.S.R. and the Congo to exploit gold deposits in the Kouilou area north of Pointe Noire. Small amounts of copper, lead, and zinc concentrates continued to be produced by Société Minière de M'Passa. Base metal production was to be greatly augmented by the mining of copper, lead, and zinc ores by Société Nationale des Mines de M'Fouati (SONAMIF) in the Yanga-Koubenza and Djenguilé regions.

Mineral exploration was active in 1975 and several new mineral occurrences were reported during the year. A Bulgarian geological mission reportedly discovered a copper, zinc, and lead deposit at Minouli, 241 kilometers west of Brazzaville. Bulgaria and the Congo were also planning the formation of a joint company for the exploitation of phosphate reserves at Tchicoula near the Cabinda border. Iron ore reserves discovered in the southwest Mount Lekoumou area were to undergo further study by Romanian geologists.

Production of cement at the Loutété plant was approximately 50,000 tons in 1975. Output was exported primarily to countries in central Africa. As part of the current 3-year plan, the capacity of the plant was to be increased from 100,000 to 300,000 tons per year.

The 3-year plan also included major infrastructure projects to alleviate serious electric power and transportation inadequacies. Electric power generation, which totaled 100 million kilowatt-hours in 1975, was to undergo a 50% increase over a 3-year period. An agreement was signed for the construction of a dam at M'Pama on the Koukouya plateau in the eastern plateau region by the Swiss firm Universal Engineering Co. The construction of a second dam at Bouenza in the south was to be financed by China. A large diesel unit was planned for Pointe Noire. The Congo Ocean Railroad (CFCO), whose 5-million-ton-per-year capacity was overtaxed by large shipments from Gabon, Cameroon, Chad, and the Central African Republic, was being modernized and realigned. In 1975, the first 87-kilometer section from Boulingui to Loubomo (formerly Dolisie) was completed. The project, which was to be finished in 1977, was financed by the IBRD, the EDF, the French Aid and Cooperation Fund, the ADB, and the Arab Bank for Economic Development in Africa.

DAHOMEY [15]

In 1975, the production of mineral commodities in Dahomey was limited to small quantities of salt, gravel, and cement. The mineral industry played a minor role in the nation's economy, and several development projects were held in abeyance during internal political and economic reorganization. At yearend, however, the Bureau Centrale des Projects was formed to secure financing for and supervise the execution of a number of proposed projects, which included the construction of a petroleum refinery and a cement plant and the exploitation of offshore oil deposits.

In addition, Dahomey scheduled several infrastructure projects, the most important of which was the development of the port city of Cotonou. Plans called for the repair of the bridge linking the cities of Cotonou and Porto Novo and the doubling of the port's cargo handling capacity. Dahomey received loans of $4.4 million [16] from the ADB and $10.9 million from the U.S. Agency for International Development (AID) to finance the project.

During the year, the Government continued its negotiations regarding terms of indemnification with the seven companies affected by the nationalization of petroleum product distribution in 1974. The firms involved were Texaco Inc., Mobil Oil Corp., Royal Dutch/Shell Group, British Petroleum Co. Ltd., AGIP, TOTAL Compagnie Française de Distribution, and the Dépôt d'Entreposage des Produits Petroliers, a holding company formed by these six interests for petroleum storage. At yearend, the only settlement reached was with Royal Dutch/Shell, which also renegotiated its offshore concession agreement signed in 1971. Two new amendments to the agreement extended the company's exploration rights and granted additional offshore acreage that had previously been held by Union Oil Co. (United States). Royal Dutch/Shell announced plans to commence development drilling in the small oilfield discovered in 1971 by Union Oil Co., the exploration rights of which were terminated in 1974 by the Dahomey Government.

In 1975, Dahomey imported approximately 2 million barrels of petroleum products from Algeria, Niger, the Ivory Coast, and Venezuela. In midyear, the Société Nationale de Commercialization des Produits Petróliers (SONACOP) lowered prices of petroleum products by an average 10% as a social welfare redistribution measure. The construction of a petroleum refinery remained in the planning stages, as efforts to secure financing were continued by Société Nationale de Raffinage (SONARAF), a joint venture between the Dahomey Government and the United Kingdom firms Litwin Ltd. and Inha International Ltd.

In June 1975, the Dahomey Government acquired a 50% interest in Société des Ciments du Dahomey, which operated the cement plant at Cotonou. Annual capacity of the plant, which manufactured cement from imported clinker, was reported at 200,000 tons, although production has remained at approximately 90,000 tons per year. The Société des Ciments d'Onigbolo, a collaboration of the Dahomey and Nigerian Governments, was formed in July 1975.

[15] Prepared by Candice Stevens.
[16] Where necessary, values have been converted from CFAF to U.S. dollars at the rate of US$1.00=CFAF224.

Discussions continued regarding the construction of a second cement factory to exploit the limestone deposits at Onigbolo and Masse, situated in the southeast Pobe area. Reserves at the two deposits were reported at 36 million tons.

Salt production decreased from 2,500 tons in 1974 to 150 tons in 1975. The decline in output was caused by the inundation of production facilities which manufactured salt from seawater at Cotonou.

The output of gravel from deposits in the southwestern Mono District remained at about 15,000 tons.

A ceramics factory operated by the Société Nationale de Céramique (SONAC) opened at Cotonou during the year. Construction of the plant, which was estimated to cost $2.1 million, was financed primarily by Société de Céramique Industrielle, owned 80% by the Government and 20% by the German firm AGROB AG. The plant was to produce 630 tons of ceramic and earthenware tiles, sanitary fixtures, and dishes per year.

The UNDP continued its mineral exploration program in Dahomey, which included airborne geophysical surveys, an underground water survey, the training of nationals through prospecting in selected areas, the establishment of a geochemical lab, and the drafting of a mining code for the Government's Geological and Mining Service. In the past 4 years, the UNDP survey has located phosphate, gypsum, gold, lignite, and diamond mineralization in various parts of the country, although none has been considered of commercial significance. The discovery of marble deposits estimated at 5 million tons in the Dadjo region prompted consideration of the construction of a marble works in the area. The most interesting deposits cited were the oolitic iron ore occurrences in the northern Kandi District. The deposit at Loumbou-Loumbou was estimated to contain 250 million tons of hematite ore averaging 50% iron, and the nearby Madékali deposit was estimated to contain 40 million tons of ore averaging 58% iron. Cost factors and lack of infrastructure prohibited the development of the deposit.

EQUATORIAL GUINEA [17]

The Republic of Equatorial Guinea included the Isla de Macias Nguema Biyogo (changed from Fernando Po in July 1973), the mainland province of Rio Muni including several near-coast islands to the southwest, and the small island of Annobón in the Atlantic Ocean some 650 kilometers southwest of the capital city, Malabo (changed from Santa Isabel in 1973). Stone, gravel, and sand were probably produced for local consumption in 1975, but the country's economy continued to depend on agriculture. No changes in the oil concessions were recorded and no exploratory drilling or surveys have been reported.

ETHIOPIA [18]

The value of mineral output, excluding refinery petroleum products, increased 16% in 1975 over that of 1974 to approximately $14.9 million.[19] This contributed less than 1% to the estimated 1975 gross national product (GNP) of $2.9 billion. Minerals produced included cement ($6 million), gold ($3.5 million), limestone ($282,000), platinum ($25,630), marine salt ($4.3 million), marble ($610,000), and small amounts of kaolin, brick clay, lignite, sand, silica sand, stone, and talc.

The Ethiopian economy maintained a real economic growth of approximately 2%, in spite of the political, social, and economic changes that had started in 1974. In addition to nationalization of most major industries and all financial institutions, the Ethiopian Provisional Military Government (EPMG) also nationalized land and instituted new labor laws. Even so, the private sector continued to play an important role in the economy. Petroleum exploration companies were not nationalized, and foreign investment for that industry was

[17] Prepared by Miller W. Ellis, physical scientist, International Data and Analysis.
[18] Prepared by Janice L. W. Jolly.
[19] Where necessary, values have been converted from Ethiopian birr (B) to U.S. dollars at the rate of B2.0855=US$1.00.

being encouraged. The Government acquired a 51% share in the four petroleum distributing companies.

The new Government policy for the mining industry, effective on February 7, 1975, was contained in Proclamation No. 39 of 1975, which may be summarized as follows:

1. Prospecting, exploration for, and exploitation of the following minerals have been reserved exclusively for the Government: Gold, platinum, silver, and other precious minerals; uranium, radium, and other radioactive minerals; large-scale salt mining operations; and geothermal power.
2. Exploration and exploitation of the following may be jointly undertaken with foreign capital: Petroleum, natural gas, carbon, and other hydrocarbons; iron, copper, nickel, and other metallic minerals; potash, phosphate, sulfur, and other nonmetallic minerals.
3. Exploration and exploitation of the following may be in the private sector: Marble, limestone and other quarry materials; small-scale salt operations; industrial clays and minerals used for bricks, chinaware, etc.; mineral waters and thermal waters.

The current mining laws were to remain in effect including Mining Proclamation No. 282 of 1971 and Mining Regulations (Legal Notice No. 396 of 1971). Under these laws, prospecting was legal under either a nonexclusive prospecting permit or an exploration license with exclusive rights within a defined area, initially for 2 years but renewable to 8 years. Mineral production was authorized under a mining lease granted for terms of 5 to 30 years. An annual quarry license was required for stone, sand, gravel, and clay. Extensive exploration program conditions, such as for petroleum, were negotiated under special agreement with the Government.

A transaction tax of 5%, a sales (turnover) tax of 2%, and a profits tax of 20% on taxable income was required for ordinary businesses. The Mining Proclamation provided for an additional tax on petroleum and natural gas so that the total of royalty, business income tax, and other eligible taxes, together with the additional tax would be 51% of the taxable income as defined for income tax calculations. For minerals other than petroleum and natural gas, there was provision for application for a flat rate of income tax of 51% or alternatively, for a profit sharing arrangement in lieu of all royalty and taxes. In addition there were moderate fees and annual rents.

Ethiopia increased the spending budget for economic development from $440 million in 1974–75 to $637.7 million in 1975–76. The proportion of the national budget allotted for development increased from 26% of the 1974 budget to 32.5% in 1975 with amounts spent on infrastructure nearly doubled.[20] Loans in 1975 came from the Federal Republic of Germany $41.5 million for water and electrical supply), the United States ($32 million for highway construction), International Development Association (IDA) ($48 million for highways and communications), and the Arab Loan Fund for Africa ($14.2 million for financing oil imports).

The total value of Ethiopean exports in 1975 was $238.7 million, a decrease of 11% compared with that of 1974. At the same time, the cost of imports increased 14% over 1974 to $309.2 million (c.i.f.). Oil imports accounted for 9% of the total import value for both 1974 and 1975. Refined petroleum products accounted for less than 3% of the total export value for 1975. About 400,000 barrels of refined oil products were exported to Afars and Issas, South Yemen, and Singapore.

The Ethiopian Petroleum Co.'s refinery at Assab processed about 3.7 million barrels of crude oil in 1975, 400,000 barrels less than in 1974. Crude petroleum imports were also down slightly in 1975 but were costing more—about $8.50 per barrel in 1974, compared with about $11.70 per barrel in 1975. Crude oil was imported from Iran and Saudi Arabia. Total petroleum imports for 1975, including refinery products, were valued at an estimated $52.9 million, compared with $47.9 million for 1974. The decline in refinery production was in part caused by insurgency action late in 1975 that shutdown the refinery for several weeks. Destruction of bridges and other interruptions to the petroleum truck convoys making deliveries to Addis Ababa also caused temporary fuel shortages throughout 1975. Gasoline rationing was instituted in June, but no vital industries were severely affected.

[20] The Financial Times (London). Budget Stresses Socialism. No. 26,754, Aug. 28, 1975, p. 5.

Gold production increased slightly over that of 1974 and came from the large alluvial deposits near Adula in southern Ethiopia. Gold was being recovered mostly by traditional handworking methods. Exploration continued on a large placer deposit that may prove to be suitable for large-scale mechanical recovery in western Wollega Province. Preliminary assessment was expected to be completed during 1976. Copper exploration by the Geological Survey continued in Tigre Province where a number of mineralized zones were known. Test drilling was to begin on a deposit in Precambrian metavolcanics. The copper-bearing zone was estimated to be 100 meters wide and to extend over several kilometers along the strike.

Large deposits of potash were known in the Danakil Depression in northwestern Ethiopia and were described in a recent report[21] as still being of economic interest. Mining of these deposits by the Ralph M. Parson Co. of the United States ended in March 1967 when the workings were flooded by an influx of freshwater and Parsons abandoned the project. The main constituent of the evaporite deposits was halite with lesser amounts of anhydrite and potassium salts. Holes drilled during exploration and mining, although exceeding 1,000 meters, did not reach the base of the evaporites. Two areas, the Crescent and Musley ore bodies, were explored in detail. A joint United Nations—Ethiopian Government geothermal survey in 1972 also indicated that the Dallol area had potential for generation of electricity by geothermal means.

Large deposits of diatomite were located near Awash and along the Lakes District and quality testing was in progress. Industrial minerals for local glass and cement companies were also under investigation. Exploration for soda ash, fluorite, borates, and phosphates also continued.

Decisions were made for the Whitestone International-Louisiana Land and Exploration Co. joint venture in oil exploration to continue in 1975, and agreements for a new work program were affirmed with the Government in August. The Whitestone group conducted 1 month of field geology and 8 months of photogeology during 1975. Royal Dutch/Shell did a brief seismic survey on its Red Sea concession. The Tenneco/Texaco/Chevron group withdrew from its concession in October as a result of disagreement over drilling schedules with the Government, unfavorable geologic indications, and uncertain investment future. The Ethiopian Government obtained a U.S. Federal court ruling in Texas against the Baruch Foster Co. for $782,368. The dispute stemmed from Ethiopia's decision in April 1970 to end a petroleum development agreement with the company. The company did not meet the deadline set for drilling a test well.

THE FRENCH TERRITORY OF THE AFARS AND ISSAS[22]

Activity in the mineral sector of the French Territory of the Afars and Issas was limited to foreign trade in 1975. Petroleum products, cement, metals, and semimanufactured metal products were the primary mineral imports and contributed to the total import value of approximately $117 million.[23] The total value of exports in 1975 was estimated at $20 million, as the territory continued to evidence a severe balance of trade deficit.

The territorial budget was scheduled for a 13% increase, from $28.4 million in 1975 to $32.6 million in 1976, with supplemental subsidies to be provided by France. The Territory of the Afars and Issas took significant steps towards independence in 1975.

The mainstay of the territory's economy continued to be transit activities related to the port of Djibouti and the Chemin de Fer Franco-Ethiopian (CFE) railroad. Events in Ethiopia that limited access to the ports of Massawa and Assab greatly enhanced Djibouti's function as an entrepôt port. Of the more than 600,000 tons of cargo transiting the port in 1975, 75% consisted of Ethiopian imports and exports. Activity at Dijibouti was further increased by the reopening of the Suez Canal in June 1975 and plans were made for a general modernization and expansion of port facilities. Another major project was the con-

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[21] Geological Survey of Ethiopia. Potash in Ethiopia. Ministry of Mines, Energy, and Water Res., Miner. Circ. No. 1, January 1976, 11 pp.

[22] Prepared by Candice Stevens.

[23] Where necessary, values have been converted from Djibouti francs (DF) to U.S. dollars at the rate of DF175=US$1.00.

struction of a road linking Djibouti and the Ethiopian capital of Addis Ababa, which would provide additional transport capacity to supplement the overtaxed CFE railroad. The 247-kilometer road would facilitate the transport of approximately 240,000 tons of goods annually, and was to be completed in 1976 at a total cost of $15 million.

With French technical and financial assistance, the Geological and Mining Exploration Office continued its survey of the territory's geothermal resources in the area of Lake Asal. Although a borehole completed in 1975 at a depth of 1,554 meters did not not find steam, an earlier borehole revealed usable steam at 1,137 meters. A feasibility study on the construction of a geothermal powerplant based on these resources was planned. The total cost of the survey was estimated at $2.2 million.

THE GAMBIA [24]

Gambia, a country with 520,000 people and a GDP of approximately $80 million,[25] had negligible mineral production in 1975. Small amounts of unrecorded sand, stone, and gravel for local use undoubtedly were produced. The only significant known mineral deposits in Gambia were kaolin, located in the Upper River District, and black ilmenite sands, found near Brufut and Sanyang in the Western District.

UNDP studies initially revealed 5 million tons of ilmenite sands in 1972. Development of this resource was seriously considered, and a letter of intent concerning beneficiation and smelting of ilmenite was signed by Gambia and Iceland in late 1973. The realization of this venture was dependent on the results of feasibility studies conducted by the UNDP during 1974. In 1975, the Gambian Ministry of Economic Planning and Industrial Development engaged Matthew Hall Ortech of the United Kingdom to conduct an economic feasibility study for the exploitation of the black sands. These ilmenite sand deposits remained undeveloped in 1975.

In 1975, Shell conducted about 3 months of seismic surveys onshore and subsequently relinquished its onshore petroleum exploration concession. Shell and Aracca Petroleum Corp. of New York retained offshore petroleum exploration rights in Gambian waters. The Government of Gambia continued to seek aid from Middle East petroleum producing countries to help finance and supply crude oil to a planned petroleum refinery. In 1975 Gambia did not have a petroleum refinery and was totally dependent on imports for petroleum products.

Gambia's road system consisted of about 300 kilometers of asphalt-surfaced roads and nearly 600 kilometers of all-weather gravel roadways. The surfacing of an additional 250 kilometers of roadway and improvement to 330 kilometers of major and secondary roads were underway in 1975.

GUINEA [26]

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.

Guinea produced an estimated 9 million tons of bauxite in 1975 and became the world's third largest bauxite producing country. Guinea Bauxite Co. (CBG), operator of the Boké project, produced over 5 million tons, and Friguia and Kindia Bauxite Office (OBK) each produced nearly 2 million tons.

CBG, owned by Halco (51%) and the Government of Guinea (49%), shipped high-grade bauxite from its plant and port at Kamsar primarily to members of Halco, a consortium of aluminum producers consisting of Aluminum Co. of America (Alcoa) (27%), Alcan Aluminium Ltd. (27%), Martin Marietta Aluminum, Inc. (20%), PUK (10%), VAW (10%), and Alumetal S.p.A. (6%).

Friguia, owned by Frialco Co. (51%) and the Government of Guinea (49%), mined bauxite for its alumina plant in

[24] Prepared by David E. Morse.
[25] Where necessary, values have been converted from Gambian delasis to U.S. dollars at the rate of 1 delasi=US$0.5050.
[26] Prepared by Horace F. Kurtz, industry economist, Division of Nonferrous Metals.

Guinea. Frialco was another consortium consisting of Noranda Mines, Ltd., (38.5%), PUK (36.5%), British Aluminium Co., Ltd. (10%), Alusuisse (10%), and VAW (5%). OBK mined bauxite at Débélé in the Kindia region entirely for export to the U.S.S.R.

The Government and Alusuisse joint venture, Société Minière et de Participations Guinée-Alusuisse (SOMIGA), continued to plan for the mining of bauxite deposits at Tougué, estimated to contain 2 billion tons. Reported plans included construction of facilities to produce 8 million tons per year of bauxite and 1.2 million tons per year of alumina. The alumina plant would be constructed with Yugoslav assistance.

The Governments of Guinea, Egypt, Kuwait, Libya, Saudi Arabia, and the United Arab Emirates signed an agreement to form an aluminum company that would exploit bauxite deposits in the Ayékoyé area north of the CBG Boké concession. Reserves were estimated at 500 million tons with an alumina content of 51.6% to 59.6%. Reported plans for the new venture included a 9-million-ton-per-year bauxite mining operation and a 2-million-ton-per-year alumina refinery.

In January 1975, the Government adopted new tax legislation covering mineral ores exported from Guinea. The taxes on bauxite and alumina were indexed to the market price of aluminum ingot. The tax per ton of bauxite ranged from 0.5% of the price per ton of aluminum for the lowest grade ores to 0.75% for bauxite containing over 55% Al_2O_3. The rate per ton of alumina was 1.0% of the price per ton of aluminum. Iron ore, reportedly, would be taxed at the rate of 1.0% of the price per ton of metal.

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, Mifergui-Nimba, has been formed to develop the Nimba deposits. The Government of Guinea holds 50% of the shares of Mifergui-Nimba, and the remainder is divided among a group of government and private interests from Africa, Europe, and Japan. The Nimba deposits were believed to contain over 500 million tons of ore, in which the iron averages 65% and occurs largely as hematite. Geological studies and drilling programs were used to prospect the Nimba deposits during 1969–72, and in 1975 a preliminary feasibility study was conducted by the Swedish company, Luossavaara-Kiirunavaara AB. Plans for the project anticipate initial production by yearend 1979 and eventual output at the rate of 15 million to 25 million tons per year. The Nimba deposits and plans for their development were described.[27]

GUINEA-BISSAU [28]

Guinea–Bissau, a small west African nation of about 800,000 people, had no important mineral production in 1975. Small amounts of sand, stone, gravel, and marine salt were produced for local consumption. Resources of bauxite, gold, iron, phosphate rock, and zircon have been reported but remained undeveloped in 1975. Esso Exploration Guinea Inc., the sole rightholder, relinquished its shelf and deepwater oil exploration permits.

IVORY COAST [29]

Since independence in 1960, the Ivory Coast's economy, based mostly on diamond, cocoa, coffee, and timber, has grown at a rapid pace. After an extraordinary year of real growth in 1974, the impact of a worldwide recession, inflation, and the upsurge in oil prices hit the Ivory Coast's economy in 1975. However, by yearend 1975, coffee and cocoa prices strengthened and the GDP reached $3.7 billion, an increase of 20% when compared with that of 1974. Per capita GDP reached $546 in 1975, which was a new high in the country's economic history.

[27] World Mining. Guinea-Nimba—Plans To Develop Huge, High-Grade Fe Deposit. V. 28, No. 9, August 1975, pp. 56–59.
[28] Prepared by David E. Morse.
[29] Prepared by E. Shekarchi.

A new 5-year development plant (1976–80) was under consideration at yearend 1975. The plan envisaged a diversified economy, provided for the production of more hydroelectric energy, and stressed agro-industrial development and improved mining of the substantial Mount Klahoyo iron ore deposits.

Increased petroleum prices continued to put pressure on the economy during 1975, since almost 75% of the Ivory Coast's energy needs were met by petroleum-generated power. Petroleum imports accounted for approximately 13% of total imports. The cost of imported crude oil, however, was partially offset by reexports of refined products to Upper Volta, Mali, and other African countries. Following its successful 1974 strategy, the Government again raised gasoline and other fuel prices to discourage consumption; import levels remained at almost the same volume as in the preceding year. Esso Exploration Co. drilled eight holes during 1975, which, except for one that showed some positive indications, were all reported dry. The consortium of Phillips/Hispanoil/Getty and AGIP concluded their seismic studies and evaluated most of the data in 1975; drilling was scheduled to begin by mid-1976.

To sustain its development program, the Government of the Ivory Coast estimated that its production of electricity must be tripled by 1980. Therefore, during 1975 the Government's efforts were directed toward the maximum development of hydroelectric power. Thus, the 500-megawatt-capacity Kossan Dam was scheduled to go into production by 1979; a second dam with 210-megawatt capacity, was under construction on the Bandama River at Taabo. Also, studies were underway to build two dams on the Sassandra River.

Iron ore deposits were found in the mountainous area near Bangolo, 600 kilometers northwest of Abidjan. The deposits, with an average grade of 33% iron, were estimated to contain 310 million tons around Mount Klahoyu and about 232 million tons at Mount Tia. A consortium consisting of British Steel Corp. (20%), Mitsubishi Shoji Kaisha (20%), Union Siderurgique du Nord et de l'Est de la France (USINOR) (10%), Hoogevens (10%), Pickards Mather (15%), and Société Pour le Development Minier de la Cote d'Ivoire (SODEMI) (5%), was organized in 1974 and was conducting feasibility studies in 1975. By yearend, no decision was made on whether the concentrates should be shipped by railroad to Port San Pedro as pelletized ore or as a slurry by pipeline. Ivory Coast Government representatives were inclined more toward a railroad system at a cost of $300 million, rather than a slurry pipeline at a cost of $80 million, since the railroad would tend to open this section of the country for further mineral prospecting and agricultural development. The planned capacity of the mine by yearend 1975 was given as 12 million tons per year; feasibility studies were to be completed by mid-1976.

Gold deposits at Ity, 60 kilometers west of Man, remained undeveloped in 1975 owing to lack of transportation and water. Recoverable reserves were reported as 583,000 troy ounces of gold.

Société Ivoirienne d'Engrais (SIVENG) produced most of the Ivory Coast's fertilizer requirements during the year. The company was awarded tax exemption on imported raw material to keep abreast of/or compete with imported fertilizer material. The plant also produced 80 tons of sulfuric acid per day.

Société Ivoirienne de Raffinage (SIR) processed about 1.5 million tons of crude petroleum in 1975; most of the refinery product aside from domestic consumption was exported to neighboring countries on the west coast of Africa.

Table 2.—Ivory Coast: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1974	1975
METALS		
Aluminum metal including alloys, all forms:		
Scrap	33	6
Semimanufactures	1,288	1,022
Copper:		
Matte	42	--
Metal including alloys, all forms	989	655
Iron and steel metal:		
Scrap	33,114	25,028
Ferroalloys	5	--
Semimanufactures including alloys, all forms	2,349	1,042
Lead metal including alloys, all forms	1,904	325
Manganese oxides	34	--
Zinc:		
Oxide	2	2
Metal:		
Scrap	174	233
Semimanufactures	206	252
Other:		
Ore and concentrate	1	2
Oxides, hydroxides and peroxides of metals, n.e.s	--	245
NONMETALS		
Abrasives:		
Dust and powder of precious and semiprecious stones ----kilograms--	--	11
Grinding and polishing wheels and stones	1	3
Barite	11	--
Cement	r 68,233	118,186
Chalk	1	4
Clays and clay products:		
Crude clays:		
Bentonite	15	3
Other clays	(1)	25
Products, refractory	5	--
Diamond:		
Industrial ----carats--	663,720	549,075
Gem ----do----	549,075	490,735
Fertilizer and fertilizer materials, crude and manufactured	12,713	6,145
Gypsum and plasters	--	1,026
Lime	226	101
Pigments, mineral:		
Natural crude	3	1
Iron oxides, processed	--	6
Salt	265	538
Sodium and potassium compounds:		
Caustic soda	330	20
Caustic potash	--	1
Stone, sand and gravel	48	135
Talc	11	(1)
Other crude minerals, n.e.s	1	4
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	(1)	14
Coal and coke including briquets	10	8
Peat including peat briquets and litter	14	(1)
Petroleum:		
Crude and partly refined ----thousand 42-gallon barrels--	(1)	(1)
Refinery products:		
Gasoline ----do----	667	598
Kerosine and jet fuel ----do----	116	108
Distillate ----do----	523	834
Residual ----do----	1,613	1,588
Lubricants ----do----	78	88
Other:		
Liquefied petroleum gas ----do----	26	29
Unspecified ----do----	1	2
Total ----do----	3,024	3,247
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	65	10

r Revised.
1 Less than ½ unit.

Table 3.—Ivory Coast: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1974	1975
METALS		
Aluminum metal including alloys, all forms	7,580	7,302
Chromium, oxide and hydroxide	2	5
Copper:		
Matte	1	(1)
Metal including alloys, all forms	403	239
Iron and steel, metal:		
Scrap	89	71
Sponge iron, powder and shot	7	10
Spiegeleisen	10	--
Ferroalloys:		
Ferromanganese	14	8
Other	7	5
Steel, primary forms	10,462	8,076
Semimanufactures	67,770	58,653
Lead:		
Oxides	69	73
Metal including alloys, all forms	184	123
Magnesium metal including alloys, all forms	(1)	8
Manganese:		
Ore and concentrate	1	497
Oxides	1,714	536
Mercury 76-pound flasks	41	7
Nickel metal including alloys, all forms	3	1
Platinum-group metals including alloys, all forms troy ounces	161	32
Silver metal including alloys, all forms do	33,372	155,529
Tin:		
Oxides	--	5
Metal including alloys, all forms	8	10
Titanium:		
Ore and concentrate	19	40
Oxides	285	234
Zinc:		
Oxide	69	50
Metal including alloys, all forms	1,281	741
Other:		
Ore and concentrate	(1)	(1)
Ash and residue containing nonferrous metals	14,855	538
Oxides, hydroxides and peroxides of metals, n.e.s	(1)	1,944
Metals including alloys, all forms	1	3
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	14,196	103
Grinding and polishing wheels and stones	89	81
Asbestos	3	2
Barite	129	90
Boron materials, crude natural borates	118	610
Cement	r 637,489	693,666
Chalk	2,306	1,404
Clays:		
Bentonite	125	53
Kaolin	79	51
Other	32	43
Diamond, all grades carats	900	161
Diatomite	353	257
Feldspar	10	253
Fertilizer materials:		
Crude phosphatic	3,480	6,897
Manufactured	27,138	19,706
Gypsum and plasters	35,584	39,125
Lime	4,664	4,759
Magnesite	6	3
Pigments, mineral:		
Natural, crude	108	135
Iron oxides, processed	62	70
Salt	33,883	32,920
Sodium and potassium compounds, n.e.s	7,459	6,183
Stone, sand and gravel	12,179	7,554
Sulfur:		
Elemental, all forms	5,586	8,017
Sulfuric acid	73	107
Talc	1,213	718
Other, crude	28,381	3,672

See footnotes at end of table.

Table 3.—Ivory Coast: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1974	1975
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	3	11
Coal, coke and briquets	285	145
Hydrogen, helium, rare gases	3	3
Peat	34	16
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	12,268	10,851
Refinery products:		
Gasoline do	27	21
Lubricants do	199	196
Other:		
Bitumen do	83	125
Unspecified do	51	35
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	1,091	621

r Revised.
1 Less than ½ unit.

LESOTHO [30]

The production of diamond, Lesotho's only reported mineral commodity, declined nearly 78% from about 11,300 carats in 1974 to slightly more than 2,500 carats in 1975, the lowest figure reported since 1963. The percentage of gem diamonds increased slightly to nearly 18% of the total production. Local diggers were responsible for this production, virtually all of which was exported. The reported value of approximately $275,000 [31] was less than one-half of 1% of Lesotho's foreign exchange credits of about $68 million reportedly derived from the earnings of Lesotho migrant workers in the Republic of South Africa. Rising costs of imports including petroleum products contributed to an increase in Lesotho's trade deficit.

On March 4, 1975, an agreement was signed between the Government of Lesotho and De Beers Consolidated Mines Ltd. that provided for the establishment of the Letseng-la-Terai open pit diamond mine at an elevation of about 3,050 meters in the Maluti Mountains of northeastern Lesotho. The De Beers Lesotho Mining Co., Ltd. was incorporated in Lesotho to construct and operate this $35-million project in which the Lesotho Government held a free 25% interest and the right, after De Beers' recovery of capital investment, to participate in the profits on a sliding scale ranging from 62½% to 72%. The airstrip and the road to the mine were improved to provide access except during severe weather conditions, and all-weather roads were under construction around the minesite, where high winds were frequent and subzero temperatures were recorded during the winter season. Power supply was increased to 125 kilovolt-amperes, and a permanent water supply was being installed. De Beers had completed a crushing plant and was constructing the diamond recovery plant, staff quarters, and other facilities.

From the outcrop of the Letseng-la-Terai kimberlite pipe, more than 55,000 tons of overburden and 2,500 tons of kimberlite were stripped and stockpiled. An access tunnel and a service raise were being excavated to facilitate underground sampling of a satellite pipe. The Letseng-la-Terai kimberlite was considered to be of lower grade (fewer carats of diamonds per 100 tons of rock) than that at most of the diamond pipes mined in southern Africa, but there were indications that the Letseng-la-Terai production would include an above-average proportion of larger diamonds and therefore, would have a higher value per carat. It was estimated that the mine and treatment plant would be operating at the rated capacity of 4,000 tons per day by late 1976.

A UNDP team, and the staffs of the Lesotho National Development Corp. (LNDC) and the Department of Mines and Geology, continued to assess and promote utilization of the country's mineral (and

[30] Prepared by Miller W. Ellis.
[31] Lesotho was a member of the Southern Africa Monetary Union. Where necessary, values have been converted from South African rands (R) to U.S. dollars at a rate of R1=US$1.3663.

other) potential. As part of the UNDP assessment, Canada provided $972,000 for the purchase of equipment and services, and the Northway Survey Corp. was completing field surveys of about 40% (12,000 square kilometers) of the area of the country. When the results of the surveys have been compiled, they are scheduled to be interpreted by another Canadian firm.

Westrans Petroleum, Inc., stopped its first test well at a depth of about 1,650 meters and reportedly surrendered its license for oil exploration in Lesotho.

Crushed stone for concrete aggregate, clay for bricks and pottery, and semiprecious stones were also produced in Lesotho, but the quantity was small and production statistics were not available.

MALAGASY REPUBLIC [32]

The National Office for Strategic Industries was established by decree in January 1975 to supervise all exploration or exploitation of mineral resources of military or strategic nature, particularly uranium and radioactive minerals, petroleum, and bituminous materials.[33] The Government stated in 1975 that it would require 51% or greater ownership in any new mining ventures. The Malagasy Republic, Botswana, Ethiopia, Kenya, Somalia, Tanzania, and Uganda agreed to the adoption of statutes establishing the East African Mineral Resources Development Center at Dodma, Tanzania. The center would be established if agreement was ratified by three of the signatory governments. The center was designed to provide the participating governments with the spectrum of services necessary to establish a basis for development of mineral resources.[34]

The $100 million Rogez hydroelectric project on the Vohitra River in east-central Malagasy Republic remained in the planning stage. Electricity to be produced from this project would provide power for a planned ferrochrome processing plant and to exploit the lateritic Ambotavy nickel deposits. The planned hydroelectic complex on the Namaroua River in the southeast was nearing the construction stage. Power to be provided by this complex is to go to proposed aluminum smelters.

Didier Ratsiraka, who became President of the Malagasy Republic in June 1975, chartered a program to provide for state takeover of all basic means of production (energy, mines, basic industries, etc.), nationalization of foreign trade, and the institution of necessary controls over the other sectors of the economy to ensure that they were not exploitive.[35] New private investment remained low, owing mainly to uncertainties concerned with the State's eventual participation in the economy. Incentives promulgated in the Investment Code of 1973 had been inadequate to stimulate much interest.

In January 1975, West Germany and the Malagasy Republic signed a $3.7 million loan agreement that enabled the island's Government to purchase roadbuilding and agricultural equipment. In April 1975, the EEC authorized the granting of about $6.8 million to finance work on the Malagasy Republic's central south axis road. Chinese technicians were reported to have been in the Republic during the first months of 1975 studying the road system and teaching roadbuilding techniques to the local people. The Tamatave–Tananarive rail link carried most of the mineral exports to Tamatave, the largest port in volume handled in 1975. Large ships had to be loaded by lighters as Tamatave was not a deepwater facility.

PRODUCTION

The mineral industry contributed less than 1% to the GDP in 1975. The primary minerals produced were chromite, graphite, and mica. Chromite production increased moderately to 194,000 tons, graphite production increased slightly to 17,800 tons and mica production dropped to 544 tons. Oil prospecting continued at a reduced level, and there had been no discoveries of exploitable reserves on or off shore through 1975. Dependence on imports of foreign crude oil contributed to the overall 1975 trade deficit.

[32] Prepared by David E. Morse.
[33] U.S. Embassy, Tananarive, Malagasy Republic. State Department Airgram A–001, Jan. 9, 1975, pp. 1–2.
[34] U.S. Embassy, Addis Abada, Ethiopia. State Department Airgram A–94, May 28, 1975, 2 pp.
[35] U.S. Embassy, Tananarive, Malagasy Republic. State Department Airgram A–038, June 4, 1975, p. 4.

TRADE

The value of mineral commodities exported, nearly $18.4 million, reflected worldwide price increases. Exports of chromite concentrate exceeded 180,000 tons, an increase of 80% over those of 1974, and were valued at $13.4 million, an increase of 250%. Graphite exports in 1975 decreased 14% to 14,600 tons but increased in value 17% to $4.4 million. Phlogopite mica exports fell 90% to 137 tons and were valued at $0.033 million. The value of gem, semiprecious, and ornamental stones exported in 1975 decreased nearly 50% owing to new government export policies. Crude petroleum imports increased 14% to 5.6 million barrels but only 8% in value during 1975.

The Government continued its tight control on imports, imposed extensive export licensing requirements, and raised export taxes on many commodities to minimize the overall trade deficit, which was $36.5 million for 1975. The Government also nationalized the nation's largest trading company and took majority control of the Malagasy Republic's main shipping lines in 1975.

Detailed statistics on mineral commodity trade are given in tables 4 and 5.

Table 4.—Malagasy Republic: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys, all forms	(1)	3
Chromite	97,952	180,320
Copper metal and alloys:		
Unwrought and scrap	249	183
Semimanufactures	(1)	(1)
Iron and steel metal:		
Scrap	18	9,714
Semimanufactures	674	220
Lead:		
Oxide	91	197
Metal including alloys, all forms	5	4
Tin metal including alloys, all forms	1	--
Titanium ore and concentrate	8	16
Zinc:		
Oxide and hydroxide	(1)	--
Metal including alloys, all forms	r (1)	15
Other, ores and concentrates	(1)	2
NONMETALS		
Abrasives, natural	23	3
Cement, hydraulic	3	2
Chalk	1	--
Clays and clay products:		
Crude clays, n.e.s	4	--
Products	35	1
Feldspar, leucite, nepheline	1	--
Fertilizer, natural and manufactured	9	--
Graphite, natural	17,568	17,451
Gypsum and plasters	(1)	--
Lime	(1)	--
Mica:		
Crude, including splittings and waste	1,796	1,871
Worked, including agglomerated splittings	9	5
Precious and semiprecious stones (except diamond), including quartz crystal and synthetic stones ---kilograms	205,271	237,745
Salt and brine	2,189	3,078
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	--	27
Worked	39	31
Quartz	168	135
Sand, excluding metal bearing ---kilograms	68	100
Sulfuric acid	1	(1)
Other nonmetals, n.e.s.:		
Mineral substances	2	4
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	r --	21
MINERAL FUELS AND RELATED MATERIALS		
Coal and briquets	1	1
Petroleum refinery products:		
Gasoline ---42-gallon barrels	411	360
Kerosine ---do	180	279
Distillate fuel oil ---do	485	440
Residual fuel oil ---do	1,268	1,096
Lubricants ---do	(1)	2
Other:		
Liquefied petroleum gas ---do	88	55
Bitumen and bituminous mixtures ---do	(1)	(1)
Unspecified ---do	88	41
Total ---do	2,520	2,273
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	(1)	--

r Revised.
1 Less than ½ unit.

Table 5.—Malagasy Republic: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Oxides and hydroxides	r (1)	78
Metal including alloys, all forms	1,277	813
Chromium oxide and hydroxide	(1)	2
Cobalt oxide and hydroxide ____kilograms	2	10
Copper:		
Ore and concentrate	(1)	(1)
Metals including alloys, all forms:	56	37
Gold metal, unworked and partly worked ____troy ounces	44,079	3,633
Iron and steel:		
Scrap	--	19
Pig iron, ferroalloys, and similar materials	15	15
Semimanufactures	33,872	44,074
Lead:		
Oxides	16	21
Metal including alloys, all forms	343	408
Magnesium metal including alloys, all forms	--	(1)
Manganese oxides	--	(1)
Mercury ____76-pound flasks	4	3
Nickel metal including alloys, all forms	(1)	(1)
Platinum-group metals including alloys, all forms ____troy ounces	--	32
Rare-earth metals including alloys, all forms	2	2
Silver metal including alloys, all forms ____troy ounces	4,180	5,980
Tin:		
Oxide	(1)	--
Metal including alloys, all forms	r 9	8
Titanium oxides	3	9
Zinc:		
Oxide and hydroxide	22	3
Metal including alloys, all forms	45	19
Other:		
Oxides and hydroxides	3	7
Metals including alloys, all forms:		
Metalloids	2	2
Alkali, alkaline earth and rare-earth metals	2	2
Pyrophoric alloys	3	2
Base metals including alloys, all forms, n.e.s	11	14
NONMETALS		
Abrasives:		
Crude, natural	10	16
Fused alumina (artificial corundum)	5	5
Dust and powder of precious and semiprecious stones ____kilograms	7	335
Grinding and polishing wheels and stones	37	42
Asbestos	10	5
Barite	1	(1)
Boron materials:		
Crude natural borates	48	40
Oxide and acid	r 2	30
Cement, hydraulic	43,496	26,891
Chalk	253	239
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	127	350
Products:		
Refractory (including nonclay bricks)	140	293
Nonrefractory	604	251
Diamond, all grades ____thousand carats	35	20
Diatomaceous earth	5	14
Fertilizer materials:		
Crude and manufactured:		
Nitrogenous	3,782	4,737
Phospatic	814	855
Potassic	3,177	4,462
Other including mixed	7,835	2,856
Ammonia	29	34
Graphite, natural	(1)	1
Gypsum and plasters	3,069	3,225
Lime	2,202	2,140
Magnesite	(1)	37
Mica, crude and worked	(1)	2
Pigments, mineral:		
Natural, crude	62	57
Iron oxides, processed	35	28
Precious and semiprecious stones (except diamond), including synthetic ____kilograms	256	(1)
Pyrite (gross weight)	20	--

See footnotes at end of table.

Table 5.—Malagasy Republic: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Quartz crystal ---- kilograms	1	--
Salt and brine	628	156
Sodium and potassium compounds	2,230	3,166
Stone, sand and gravel:		
Dimension stone, crude and worked	(1)	6
Gravel and crushed rock, n.e.s	6	8
Quartz and quartzite	(1)	(1)
Sand, excluding bearing	6	3
Sulfur:		
Elemental, all forms	r 5	3
Sulfur dioxide	1	2
Sulfuric acid, oleum	138	157
Talc, steatite, soapstone, pyrophyllite	1	17
Other:		
Crude nonmetals, n.e.s	2,277	70
Oxides and hydroxides of magnesium, strontium, barium	55	5
Bromine, iodine, fluorine	r (1)	(1)
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	(1)	--
Carbon black	1	6
Coal including briquets, all grades	12,352	13,734
Coke and semicoke	125	53
Hydrogen, helium, rare gases	9	8
Petroleum:		
Crude and partly refined ---- thousand 42-gallon barrels	4,852	4,537
Refinery products:		
Gasoline ---- do	58	29
Kerosine and jet fuel ---- do	3	5
Distillate fuel oil ---- do	13	60
Residual fuel oil ---- do	--	27
Lubricants ---- do	54	32
Other:		
Liquefied petroleum gas ---- do	(1)	(1)
Mineral jelly and wax ---- do	29	26
Pitch and pitch coke ---- do	(1)	(1)
Petroleum coke ---- do	--	1
Bitumen, bituminous mixtures and other residues ---- do	24	53
Unspecified ---- do	(1)	2
Total ---- do	181	235
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 63	144

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

Metals.—*Bauxite.*—Development of the 165-million-ton Manantenia bauxite deposit was being evaluated. Japan loaned $14 million for construction of a hydroelectric complex on the Namoroua River that would supply electric power to proposed aluminum smelters.

Chromite.—Madagascar Chrome Resources Development Co., a joint venture company, began exploration for chromite. The new company was a partnership between seven Japanese ferroalloy producers and C. Itoh & Co. (Japan), BRGM, and Compagnie de Financiese Eurofricaine, a subsidiary of Anglo American Corp. (Republic of South Africa).[36] Geologic survey and diamond drilling, to delineate dimensions of more than 350 known outcrops of chromite ore, were expected to take several years to complete. The 8,000 square-kilometer area of interest is in the Andilamena and Tsaratanana Districts, north and west of Lake Alaotra.[37]

Late in 1975, the Government nationalized the country's only chromite mining firm, formerly controlled by PUK. PUK reportedly received a contract to manage the mining operations in the negotiated settlement. Chromite production was expected to remain near 200,000 tons per year for the next several years, nearly 100% of capacity of the mines in 1975. Exports to Japan from Madagascar Chrome Resources and Development Co.'s venture was expected to begin in 1979. A 40,000-ton fer-

[36] Engineering and Mining Journal. E/MJ Exploration Roundup. V. 176, No. 3, March 1975, p. 17.

[37] Mining Journal (London). Malagasy: New Company for Chrome Prospect. V. 284, No. 7274, Jan. 17, 1975, p. 45.

rochrome plant was planned to begin operation in 1979–80 and would use power generated from the planned Rogez power project.

Iron.—Iron ore deposits discovered at Ambatavy, Bekiskopa, Fastensara, and Ambohipaky were being evaluated. The 200-million- to 300-million-ton deposit near Soalala on the northwest coast was being studied for possible development.

Nickel.—The lateritic nickel deposit at Ambatavy was being evaluated and could be exploited with power generated from the proposed Rogez power project on the Vohitra River.

Nonmetals.—*Cement.*—The cement plant located at Amoania continued to operate close to full capacity. The construction of a second plant near Tananarive was under consideration because the capital district was the major area of usage.

Graphite.—Graphite production remained close to the levels of 1973 and 1974. Production was limited by the producer's reluctance to make significant improvements due to uncertainties in Government policies although demand for quality flake remained high in the world market.

Phlogopite Mica.—Production decreased to 550 tons and exports fell to 137 tons. Logistical difficulties and erratic market conditions due to synthetic competition contributed to decreased production and exports.

Mineral Fuels.—*Coal.*—UDC maintained a coal prospecting permit in the Tulear region in the southwest. Little activity had resulted owing to infrastructure requirements for development.

Petroleum.—Chevron Oil Co., a subsidiary of the Standard Oil Co. of California, continued exploration for oil; the presence of oil and/or gas had been indicated in several areas but no exploitable reserves had been found. The petroleum refinery at Tamatave, with a capacity of 31,000 barrels per day, continued operation.

Other Minerals.—Interest in mining the ilmenite and zircon beach sands along the east coast near Tamatave was expressed by Italy's Montedison Co.

United States Steel Corp. and BRGM were interested in developing beach sand deposits in the Fort-Dauphine area along the southeast coast.

MALAWI [38]

The mineral industry of Malawi contributed very little to the nation's 1975 GDP of $741.7 million[39] (at current prices), but imported mineral products, such as fertilizers and petroleum, were significant in their effects on inflation. Mineral production consisted mainly of cement (up 26% to 102,330 tons), dolomite (91 tons), agates (down 85% to 3.2 tons) and limestone (158,000 tons).

The Malawi economy continued to grow steadily in 1975; the GDP increased 6% in real terms despite the worst deterioration in its balance of trade and terms of trade since independence. Total 1975 exports increased 18% in value, but imports increased 38% over those of 1974 to an estimated $246.5 million.[40] The Republic of South Africa, the source of 22% of imports, and the United Kingdom, with 30%, continued to be Malawi's chief suppliers in 1975. Imports from Southern Rhodesia (8.6%), Japan (7%), West Germany (4.5%), Zambia (3.5%), and the United States (3%) also remained important. Trade with the EEC was expected to expand when the Lome agreement became operational in 1976. Trade with the United States was also expected to expand with the addition of export products allowed under the GSP, making a total of 89% of Malawi exports to the United States duty-free. Products from the United States also received most-favored-nation treatment under Malawi's tariff revision effective July 1, 1975, which eliminated the Commonwealth preference structure.

The changing political situation in southern Africa was expected to place additional strain on the economy of Malawi through the closure of the Mozambique-Southern Rhodesia border and suspension of direct transportation links between Malawi and Southern Rhodesia in 1976. Trade with both Rhodesia and the Republic of South Africa would be affected. By late 1975, the increased Zambian traffic

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[38] Prepared by Janice L. W. Jolly.

[39] Where necessary, values have been converted from Malawi kwacha (MK) to U.S. dollars at the rate of MK1=US$1.13.

[40] U.S. Embassy, Lilongwe, Malawi. State Department Airgram A–21, June 17, 1976, 7 pp.

through Malawi caused by the closure of the Angolan route resulted in a backlog of goods at the Port of Beira in Mozambique, including 28,000 tons of fertilizer for Malawi. Some problems were caused by the lack of adequate Zambian vehicles to forward goods from Malawi at the Salima railroad terminus. The heavier loads were being picked up by trucks at Blantyre for transport to Zambia. Improvements to the Blantyre-to-Salima railroad were to be finished in 1976, allowing heavier loads to be moved beyond Blantyre. Only 10 to 12 locomotives on the Malawi Railroad were operative at a time owing to mechanical problems. The Beira to Katete road through Moatize (Mozambique) to Malawi and Zambia, which would alleviate pressures on the railroad, was not expected to be surfaced until mid-1976. Under an arrangement with the Zambian Government, Malawi Railways was moving the maximum feasible 24,000 tons of Zambian imports each month, including 12,000 tons from the Port of Nacala, 7,000 tons from the Republic of South Africa via Rhodesia, and 5,000 tons from Beira. Approximately 6,000 tons per month of Zambian copper via road and rail through Malawi went to the Port of Nacala, with the objective of reaching 10,000 tons of copper per month.

In the third quarter of 1975, 854 persons were employed by the mining and quarrying industry, earning an average of $35 per month.[41] The Mwanakatwe Salaries Commission announced salary increases for the mining industry on July 1, 1975, with the lowest paid receiving the highest increases. By yearend 1975, Malawi had moved closer to lifting the 17-month ban on recruiting labor for South African gold mines when discussions to lift the ban were initiated.

Construction started in May 1975 on the second stage of the Tedzani Falls hydroelectric project on the Shire River where two 10-megawatt power units were to be added. The project report was completed on the Nkula Falls State II hydroelectric project. The Nkula Falls State II project was to be financed through the United Kingdom's technical aid by the Ministry of Overseas Development.

The major mineral produced in Malawi for 1975 was limestone or marble for manufacture of cement, quarried by the Portland Cement Co. of Malawi at its Changalumi quarry west of Zomba. A $1.2 million prestressed concrete railroad ties plant was officially opened in Salima. The plant was designed and constructed with South African aid. Production started in June 1975 employing 190 people. The railroad ties were to be used in the new Salima to Lilongwe rail line. The Malawi Geological Survey sampled and drilled marble deposits near Golomoti south of Salima indicating substantial reserves.

A UNDP team, assisted by the Malawi Geological Survey, completed their ground survey following up the airborne geophysical surveys of the Nsanje, Dzlanyama, Rumphi, and Karonga areas. Several new mineral occurrences were found, but none was of major economic significance.

The South Africa Chamber of Mines was aiding the Malawi Government in the development of mineral resources. Attention was being particularly given to coal, pyrite/pyrrhotite, and apatite. Coal seams in the Karroo sediments of the Ngana Basin were drilled confirming previous estimates of 14 million tons of workable coal. The phosphate deposits near Tundulu were being considered for development. A Chamber of Mines fertilizer production expert began work on a model for the manufacture of sulfuric acid, ammonium sulfate and phosphatic fertilizers. Ten acres with apparent potential for commercial concentration of apatite for fertilizer were sampled. The Geological Survey team drilled the Chisepo pyrite deposit located 50 kilometers northwest of Lilongwe.

Lonrho (Malawi) Ltd. continued to investigate the strontianite monazite deposit at Kangankunde Hill, located 15 kilometers south of Balaka. Gypsum Industries Ltd. continued its sampling of the Kapirikamodzi vermiculite deposit, located 35 kilometers west of Blantyre. Eland Exploration (Pty.) Ltd. continued geochemical, geophysical, and drilling surveys for base metals in southern and central Malawi. An aluminum smelting plant utilizing Cabora Bassa electricity and the Malawi bauxite ores from the Lichenya Plateau at Mount Mlanje was still under consideration.

Malawi imported 7% more gasoline by volume in 1975 than in 1974, and the total value of petroleum products imported in

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[41] Reserve Bank of Malawi. Third Quarter Review, 1975. Financ. and Econ. Rev., v. 7, No. 3, 1975, p. 122.

1975 rose 5%. The suppliers of petroleum products continued to be the Republic of South Africa, Iran, and Mozambique. The Oil Co. (Malawi) Ltd. and Shell (Malawi) Ltd. signed an agreement during 1975 to merge their business and trading activities. The the name of the new company was to be Shell BP and Oilcom Ltd., controlled by directors representing both local and overseas shareholders.

Table 6.—Malawi: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Copper metal including alloys, all forms	53	24
Iron and steel metal:		
Scrap	380	1,058
Pig iron, ferroalloys, crude steel, semimanufactures	r 1,195	9,304
Lead metal including alloys, all forms	112	92
Zinc metal, all forms	--	23
NONMETALS		
Cement, hydraulic	14	--
Clay products, nonrefractory	--	22
Precious and semiprecious stones, unspecified kilograms	3,062	23,359
Stone, sand and gravel	19	80
Other nonmetals, n.e.s	(1)	23
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline 42-gallon barrels	36,121	--
Jet fuel do	879	289
Distillate fuel oil do	46,540	3,251
Lubricants do	3,304	12,608
Other:		
Paraffin do	9,908	--
Unspecified do	614	2,449

r Revised.
1 Revised to none.

Table 7.—Malawi: Imports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal and alloys, all forms	r 807	378
Copper metal and alloys, all forms	r 42	60
Iron and steel: Scrap, pig iron, ferroalloys, crude steel and semi-manufactures	r 29,717	30,384
Lead metal and alloys, all forms	r 14	6
Nickel metal and alloys, all forms	(1)	1
Tin metal and alloys, all forms	205	89
Zinc metal and alloys, all forms	5	50
Other precious metals, not further specified troy ounces	1,812	147,835
NONMETALS		
Abrasives, natural, grinding and polishing wheels and stones	16	29
Cement, hydraulic	231	210
Clay products:		
Refractory	416	467
Nonrefractory	1,161	496
Fertilizer materials, manufactured:		
Nitrogenous	r 29,263	27,069
Phosphatic	795	228
Potassic	27	--
Other	13,381	15,812
Lime	2,686	3,163
Pyrite	100	--
Salt and brine	r 13,596	15,641
Sodium and potassium compounds, n.e.s	2,098	2,073
Stone, sand and gravel:		
Dimension stone	r 225	121
Other	196	498
Sulfur:		
Elemental	49	358
Sulfuric acid	14	24
Other nonmetals, n.e.s.:		
Crude	2,683	3,001
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals	r 1,995	2 1,417
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	7,536	6,222
Carbon black	8	7
Coal, coke and peat	r 57,678	53,007
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	335	296
Jet fuel do	69	115
Kerosine do	r 2	2
Distillate fuel oil do	435	393
Residual fuel oil do	35	34
Lubricants do	27	36
Paraffin do	6	6
Other do	r 141	100
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	170	114

r Revised.
1 Less than ½ unit.
2 Partial figure, excludes quantity valued at $113,693.

MALI [42]

The mineral industry of Mali in 1975 consisted primarily of salt mined at Taoudeni, small amounts of gold extracted from the Kalana mine, and cement processed by the plant at Diamou. No official production figures were available. Deposits of bauxite, lithium, uranium, iron ore, copper, phosphate, diamond, and manganese exist, but were still in the exploration stage. Some gold was exported. Total exports were valued at $53.9 million[43] while total imports were valued at $188.3 million for 1975.

On January 8, 1975, Mali was one of 12 Francophone Africa countries that signed an agreement aimed at strengthening the African Regional Labor Administration Center, based in Cameroon. The center

[42] Prepared by Janice L. W. Jolly.
[43] Where necessary, values have been converted from Malian francs (MF) to U.S. dollars at the rate of MF42C=US$1.00.

was to be reorganized into an international body to foster professional education. In April 1975, the border dispute between Mali and Upper Volta erupted at the West African Economic Community (CEAO) meeting held in Niamey, Niger, and threatened continued cooperation between member nations. Despite this, the first summit conference of the CEAO was deemed a success on the economic level.

The U.S.S.R. was expected to provide aid aimed at doubling the capacity of the Diamou cement works and for the exploitation of the Kalana gold deposit, located in western Mali. Full-scale mining of the Kalana deposit was to have started in 1975. A formal agreement was signed in May 1975 between the Mali Government and the Japanese Power Reactor and Nuclear Fuel Development Corp. for uranium prospecting over 100,000 square kilometers in the Adrar de Iforas area. Plans included a 3-year exploration program beginning with a 3-month aerial survey.

The French BRGM prospected for copper and other minerals under an exclusive license in the Bougouni-Sikasso area of western Mali. Two recent BRGM publications pertaining to areas of known mineralization were of interest. In the first,[44] the geology of the Upper Precambrian rocks at the southern border of the Mandiques Plateau in western Mali was described. The report is basically a sedimentological discussion, but some ferrugenous sediments, which may contain ore at places, are also described. Iron ore has been described in the Bafoulobe area and the Mandinque plateau with resources estimated at 1 billion tons, half of which was estimated to contain 50% to 60% iron. The second report was a chapter in the BRGM Memoire, Géologie du Diamant,[45] which describes in some detail eight kimberlites occurring near Kenieba. Diamond has been discovered in several of them, and some diamonds have been recovered from river gravels, including a 98-carat white stone at Sansanto. Although limited prospecting has been done in the area, no large-scale production was ever instituted.

Prospecting for petroleum continued in 1975 with Esso Exploration owning a 50% interest in the Texaco permit. Texaco was operator and conducted an 11-party month seismic and gravity survey, as well as 7 party months of ground magnetics. The Sun-Global Menaka permit was extended, and they carried out 4 party months of seismic and gravity survey.

MAURITANIA [46]

In 1975, the dominant mineral industry in Mauritania was the production of iron ore, which was nationalized at yearend 1974. During the year, the Mauritanian Government completed the takeover of its mineral sector when the Akjoujt copper mines were nationalized. The balance of mineral production consisted of gypsum and small amounts of salt and byproduct gold, which were under the direction of the Société Nationale Industrielle et Minière (SNIM), the State's industrial holding company in charge of mining operations. A unit of SNIM, the Division de la Recherche Geoligique (DRG), was responsible for the supervision of all mineral and petroleum exploration in the country, and proposed a number of prospecting activities in selected areas. SNIM was also involved in mineral-related industrialization projects, which included the construction of a petroleum refinery, a copper foundry, an integrated steel mill, and an explosives factory.

In 1975, the Government further increased its participation in the economic sector by establishing provisional state control over the largest commercial bank, the Banque Internationale pour le Mauritanie, and nationalizing the production of electric power. The State-owned Société Nationale d'Eau et d'Électricité (SONELEC) replaced the Société Mauritanienne d'Eau et d'Électricité (MAURELEC), and assumed responsibility for the production and distribution of water and electricity, and the construction and operation of reservoirs, purification facilities, and power stations.

In June 1975, Mauritania was one of the first three countries, together with Vene-

[44] Carrere, J. M. Le Pre'cambrian Superieur de la Bordure Sud des Monts Mandinques (Mali Occidental) (The Upper Precambrian of the southern border of the Mandiques mountains (western Mali). Bull. BRGM, v. 2, Sec. 2, No. 5, 1975, pp. 461–772.

[45] Bardet, M. G. Géologie du Diamant (Geology of Diamond). Memoires du BRGM, No. 83, 1974, pp. 198–203.

[46] Prepared by Candice Stevens.

zuela and Algeria, to sign the charter of the Association of Iron Ore Exporting Countries (AIEC). The goals of the AIEC included ensuring the orderly and healthy growth of iron ore export trade; securing fair and remunerative returns from its exploration, processing, and marketing; and promoting close cooperation among member countries for economic and social development. After year-long negotiations, the Mauritanian Government also reached agreement with the former owners of its iron ore mines, the shareholders in the Société Anonyme des Mines de Fer de Mauritanie (MIFERMA). The terms of compensation provided that the Government pay shareholders $40 million by March 31, 1976, and five payments thereafter of $10 million each over a 5-year period. Prior to nationalization, MIFERMA had been owned principally by various French industrial and banking interests, 18% by Finsider (Italy), 5% by August Thyssen Hütte AG (West Germany), and 3% by the International Minerals & Chemical Corp. (United States).

Iron ore production at the Zouerate mines, situated in northeastern Mauritania near the Spanish Sahara border, was under the direction of the newly-formed Complexe Minier du Nord (COMINOR), a division of SNIM. Combined output of the three mines—Tazadit, Rouessa, and F'Derick —was 8.7 million tons of 64.5% iron ore, a 26% decrease from the 1974 level of 11.7 million tons. However, due to higher prices and the better grade of the ore, income from iron ore exports increased from $130 million[47] to $138 million, accounting for approximately 84% of Mauritania's export revenue in 1975. SNIM negotiated new supply contracts with European and Japanese customers to replace the previous arrangements under MIFERMA; a new agreement with five major Japanese steelmakers provided for the export to Japan of 1 million tons of iron ore per year up to 1980. In 1975, the primary purchases continued to be France (24%), the United Kingdom (19%), Italy (17%), and Japan (10%).

Aside from the three producing ore bodies, whose combined reserves were estimated at 2 billion tons, there were extensive lower-grade ore reserves in outlying bodies known as the Guelb deposits. Situated within a radius of 50 kilometers of Zouerate, total reserves of the Guelbs were estimated at 2 billion tons of magnetite ore averaging 38% iron. In 1975, SNIM announced plans to commence development of the Guelb deposits; production was to begin in 1980 at an annual rate of 6 million tons which would complement and eventually replace output from F'Derick and Tazadit mines. The study of methods of concentrating ore from the Guelbs, as well as the lower-grade ore (28% to 35%) interspersed with the high grade deposits, continued at the pilot plant at Zouerate.

In February 1975, the Mauritanian Government was prompted by depressed world copper prices and the continuation of technical difficulties in ore concentration to nationalize the copper mines at Akjoujt. SNIM acquired the foreign shareholdings in the Société Minière de Mauritanie (SOMINA), which were held by Charter Consolidated Co. (44%), International Finance Corp. (15%), and a French consortium headed by Peñarroya (29%). The arrangement provided for the stockholders to pay approximately $50 million of the guaranteed debts of the deficit-ridden company, while the Government agreed to take over up to $20 million of SOMINA's nonguaranteed debts, in particular the money owed to suppliers. During the year, Mauritania applied for membership in the CIPEC, which sought to moderate the worldwide fluctuation of copper prices.

Due to the closure of the mines from May to October after the departure of foreign technicians, copper production declined more than 19%, from 20,079 tons of concentrate in 1974 to 16,203 tons in 1975. The Akjoujt mines were situated approximately 200 kilometers northeast of the capital, Nouakchott. The ore body was comprised of overlying copper oxide grading into copper sulfide at a depth of about 30 meters. Copper oxide reserves were estimated at 2.3 million tons averaging 2.7% copper and 2.3 grams of gold per ton; copper sulfide reserves were estimated at 13.7 million tons averaging 2.3% copper and 1.3 grams of gold per ton. Charter Consolidated Co. developed the TORCO process (treatment of refractory copper ore) for exploitation of the Mauritanian copper

[47] Where necessary, values have been converted from Mauritanian ouguiya (UM) to U.S. dollars at the rate of UM45=US$1.00.

oxide ore which could not be profitably floated or leached. The second stage of mine development would be exploitation of the sulfide ore which, though less difficult to treat, would necessitate new installations. SNIM was considering the construction of a conventional copper sulfide flotation plant at Akjoujt, but no decision had been made at yearend.

In 1975, bids were solicited for construction of a copper smelter at Nouakchott, scheduled to go onstream by 1978. Financing was to be provided by Société Arabe d'Industries Metallurgiques (SAMIA), a joint venture between SNIM and a consortium of Kuwaiti interests. The smelter was to have an annual processing capacity of 140,000 tons of copper concentrate, and was to recover 30,000 tons of metal, 1,820 kilograms of gold, 2,500 kilograms of silver, and 100,000 tons of sulfuric acid per year.

The production of gypsum, completely under the control of SNIM, increased 52% from 8,312 tons in 1974 to 12,669 tons in 1975. Most of the year's output was exported to Senegal for use in the West African Cement Co. plant at Rufisque, and earned Mauritania about $150,000 in foreign exchange income. Mining at the gypsum quarry at Sebkha de N'Drahamcha, located 65 kilometers north of Nouakchott, began in October 1973. The evaporite gypsum deposits were comprised of 92% hydrous calcium sulfate, 2% clay, and a negligible quantity of sodium chloride. Reserves were estimated at 11 million tons.

Exploration for petroleum resources in Mauritania was limited in 1975. Texaco Mauritania Inc. and AGIP Recherches et Exploitation (Mauritania) relinquished their concession areas in the latter part of the year due to unsuccessful onshore exploration activity. Also, Shell Mauritania Co. ceased drilling in its 31,800-square-kilometer offshore area in early 1975. The only drilling activity reported was that of Western Enterprises, Inc., which acquired rights to 93% of Planet Oil and Mineral Corporation's Cap Timeris concession area.

Texaco also sold its interests in marketing operations to SNIM, which established the L'Unité de Commercialisation de Produits Pétroliers (UCPP) for the sale and distribution of petroleum products in Mauritania. In 1975, Mauritania consumed approximately 1 million barrels of petroleum products, all of which were imported. Under the supervision of UCPP, construction began in September on a petroleum refinery at Nouadhibou. The Austrian firm, Vöest-Alpine, contracted to build the refinery at a cost of about $75 million. Scheduled for completion in July 1977, the refinery was to have an annual capacity of about 7 million barrels of crude oil, supplied primarily from Algeria. Annual production was to consist of approximately 2 million barrels of gasoline, 1.4 million barrels of diesel fuel, 2.5 million barrels of fuel oil, 580,000 barrels of jet fuel, and 180,000 barrels of liquefied petroleum gas. Approximately 1/3 of output was to be consumed domestically with the balance destined for European markets.

In addition to the petroleum refinery, September also marked the initiation of construction of an explosives factory at Nouadhibou. SNIM was the director of the project, which was to be built by the Société Française des Explosifs at an estimated cost of $2 million. Daily capacity was to be 28 tons of explosives, all of which would be utilized in the mining operations at Zouerate and Akjoujt.

Construction of a 1 million-ton-per-year steel mill at Nouadhibou remained in the planning stages at yearend 1975. The results of a feasibility study conducted by H. K. Ferguson Co. (United States) were under consideration by SAMIA, which was to assume financing and management responsibilities for the project. Questions regarding infrastructure requirements for the steel mill, particularly sources of coking coal and electric power, had yet to be resolved.

Exploration for additional mineral resources, particularly uranium and phosphate, was active in 1975. In addition, the Mauritanian Government announced a number of mineral research projects to be executed during the period 1975–80. The proposed projects for the exploration and development of Mauritania's mineral resources were based on a comprehensive geological survey by BRGM.[48] Promising uranium mineralization was cited in various areas, and in July, the Mauritanian Government renegotiated its exploration agreement with the Compagnie Française des Pétroles (CFP). Prospecting was being

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[48] Bureau de Recherches Geologiques et Minières (Paris). Plan Mineral de la Republique Islamique de Mauritania. June 1975.

carried out in the northern Tasiast and Dorsale Reguibat areas by CFP on behalf of a French-Japanese consortium comprised of CFP, Péchiney Ugine Kuhlmann, the Commissariat à L'Energie Atomique, TOTAL Compagnie Minière et Nucleaire, and Tokyo Uranium Development Co., Ltd. The new agreement provided for the Mauritanian Government to acquire a 51% share of any joint venture formed to exploit uranium findings.

An agreement for phosphate exploration was renewed with a consortium consisting of SNIM, BRGM, the Sociètè Sénégalaise des Phosphate des Thies, and the Romanian firm, GEOMINES. The area under study was a triangular region bordered by the towns of Aleg, Bohe, and Kaedi in the Senegal River Basin. The Government plan also scheduled phosphate exploration for the Tankarkart area southwest of Akjoujt and a region along the eastern border of the Taoudenni Basin. At yearend, Mauritania and Morocco were negotiating the formation of a joint company to undertake the exploration and development of mineral resources in the Western Sahara. A tripartite agreement concluded in November 1975 was to place the phosphate-rich territory of Western Sahara, previously controlled by Spain, under joint Moroccan/Mauritanian administration.

Several other areas identified by BRGM as having mineral potential were to be fully evaluated under the direction of the DRG of SNIM. Prospecting for iron ore was to continue in the Akjoujt region, where the Gleibat El Khader was estimated to have reserves of 18 million tons averaging 51% iron. The copper reserves of Akjoujt were to be reevaluated, and a feasibility study of the potentially significant copper deposits in the northern Sebkhas Ghallaman region and southern areas of Selibaby and Affolé was to be conducted. Portions of the northern Dorsale Reguibat region were to be examined for gold (Conchita-Florence), tin (Catherine), and manganese. Black sands along the Atlantic coast, which were estimated to contain 250,000 tons of ilmenite, were to be examined for rutile, zircon, and monazite content. A feasibility study of developing construction materials, particularly ornamental stone, vermiculite, and sillimanite in the Tasiast region, was to be completed. A total of 27 projects were outlined, with an initial estimated cost of $4 million.

Plans were also underway for the construction of a 1,100-kilometer road from the port of Nouakchott to the eastern city of Nema, which would open up the eastern part of the country. The Brazilian firm, Mendes Junior, contracted to construct the first segment of the road between Nouakchott and Kiffai. The project was to be financed by Saudi Arabia, Kuwait, and the United Arab Emirates. At the same time, the Government had under study a plan for the construction of a deepwater port at Nouakchott. An agreement concluded in 1971 provided for the feasibility study and financing to be supplied by China; in a later agreement, the Chinese credited Mauritania approximately $53 million in an interest-free loan over a 37-year period for the construction of the port. The port's capacity was to be increased from 200,000 to 500,000 tons per year and would accommodate vessels of 10,000 deadweight tons.

Table 8.—Mauritania: Exports of mineral commodities

Commodity	1973 r	1974	Principal destinations, 1974
METALS			
Copper ore and concentrate, gross weight metric tons	21,651	37,409	France 26,722; Spain 10,687.
Iron and steel, ore and concentrate except roasted pyrite thousand metric tons	10,331	10,301	France 2,588; Japan 1,917; United Kingdom 1,672.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products (not differentiated) thousand 42-gallon barrels	112	181	NA.

r Revised. NA Not available.

Table 9.—Mauritania: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys, all forms	r 219	252
Copper metal including alloys, all forms	19	27
Iron and steel metal, all forms	r 8,623	11,799
Other metals including alloys, all forms	182	208
NONMETALS		
Cement, hydraulic	r 8,585	3,221
Fertilizer materials, all forms	r 3,810	2,163
Other nonmetals, n.e.s.:		
Nonmetallic minerals	22,287	34,993
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	r 467	772
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products (not differentiated) thousand 42-gallon barrels	635	1,250

r Revised.

MAURITIUS [49]

The mineral industry of Mauritius contributed less than 1% of the estimated 1975 GDP of $500 million[50] at current prices. The 1975 mineral production consisted of 6,000 tons of salt valued at $299,000 and 7,300 tons of lime valued at $4,100. Both commodities increased in amount produced and in value over that of 1974; salt production rose 20%, and lime, 82%. In spite of the devastating cyclone Gervaise in 1975, Mauritius came through the year with a thriving economy. The rate of inflation had fallen to 14%, compared with 29% a few years earlier. There had been significant achievement in the nation's growth during the 4-year plan period which ended in mid-1975. The GDP increased from $151 million in 1970 to $470 million in 1974. The manufacturing sector had increased by 138% since 1970. Continued progress was anticipated as the 1975–80 5-year development plan was launched. The GDP was expected to grow 6.9% per year. Capital investment over the plan period was planned at about 28% of the GDP with estimated external assistance resources for the programing period totaling approximately $256 million. The main objectives of the 5-year plan were to create employment and to develop self-sufficiency in food, exportation of petroleum products through petrochemical development, and a 250% increase in hydroelectric capacity. The private sector was to provide about 25% of the necessary development funds.

One of the Government's tools for development was the Development Bank of Mauritius, of which the Government Financial Secretary was ex-officio chairman. The UNDP and the World Bank were to assist in establishing the bank's operations and to train Mauritian personnel. Foreign aid for development was to come from France ($25 million for hydroelectric projects), India ($12 million in commercial credits for industrial equipment), the United Kingdom ($10 million for port development), the ADB ($10 million for the Guibes reservoir and hydroelectric plant), and the Arab League. The Arab League was to subsidize the purchase of petroleum products. Aid in the form of subsidies from the Arab League was to be calculated on the annual oil import figures. The loan was to be refundable over a long period and carry 1% interest. In 1975, Mauritius received petroleum import aid amounting to $2.3 million from the Arab League as compensation for the increase in petroleum prices. The UNDP was doing geological studies in support of the Quātre Soeurs hydroelectric power project. The EDF was to aid in establishing technical schools. CIDA was to finance the cost of the first three phases of the water supply development in Rodriques (about $1.4 million).

[49] Prepared by Janice L. W. Jolly.

[50] Where necessary, values have been converted from Mauritian rupees (Mau Rs) to U.S. dollars at the rate of Mau Rs6.02=US$1.00.

In July 1975, a port authority was created with the principal objective of modernizing the harbor. The first deepwater harbor was to be built and completed within 2 years. The new piers were to be built with a World Bank long-term loan of $10.5 million. A United Kingdom firm was to dredge the Roche Bois harbor, with financing from the United Kingdom. The Roche Bois harbor was to have a deepwater pier completed around the end of 1978.

A Ministry of Power, Fuel, and Energy was set up in January 1974. Mauritius has no known mineral resources of great significance, although oil prospecting was taking place near the islands of the St. Brandon Group; drilling had commenced by the Texaco Group and was expected to continue during the 1975–80 plan period. Development of water resources was of fundamental importance to the Mauritian economy. The Quatre Soeurs hydroelectric scheme, aimed at development of the Grand River South-East, started in April 1975. This activity was being carried out in conjunction with the Central Electricity Board and Central Water Authority.

NIGER [51]

The mineral industry of Niger accounted for 39% of all export revenue earned during 1975. Government revenues from mining operations in 1975 were about $6 million.[52] A new profit sharing arrangement negotiated with the French Government in 1975 was expected to boost revenues to over $18 million in the future.

The Government encouraged foreign investment in the industrial sector through its liberal investment code, as revised in 1974. The code encouraged investments in energy production; mineral exploration, production and processing; and fertilizer production. Numerous obstacles, such as underdeveloped infrastructure, extremely high energy costs, and lack of trained manpower, had to be resolved.

In 1975, Niger ranked fifth among the world's producers of uranium, having produced 1,535 tons of uranium concentrate—16% higher than 1974 production. Niger also ranked fifth in the world in known uranium reserves with over 40 million tons estimated. Mining operations at the Arlit mine were carried out by the Société des Mines de l'Air (SOMAIR), an international consortium founded in 1968, composed of the Government of Niger, the French Commissariat à L'Énergie Atomique (CEA), Compagnie Française des Minerais d'Uranium (France), Péchiney-Mokta Mining Co. (France), Urangesellschaft AG (West Germany), and Agip Nucleare S.p.A. (Italy). The Arlit mine employed 90 engineers and about 600 workers during 1975. A second company, a French, Japanese, and Spanish consortium Compagnie Minière d'Akouta (COMINAK), continued development and infrastructure at the Akouta mine toward an output of 2,000 tons of uranium concentrate by 1979, Japan was to receive 4% of the production from this mine. A third uranium consortium, in which COMINAK was a participant, anticipated production of uranium concentrate at its Imouraren mine, south of Arlit, beginning in 1980.

To facilitate the transportation of uranium concentrate to railroads in neighboring countries and to open the northeast of Niger for further mineral prospecting, the Government asked the consortium members to contribute up to $70 million in 1976 and 1977 for the construction of road between Tahoua and the uranium mines around Arlit. The details of this project were not known by the yearend.

In addition to uranium, there was a small production of cassiterite concentrates by Société Minière de Niger, a mixed private and public enterprise. Tin production in 1975 totaled 137 tons, of which 127 tons were exported to the European market. Most of the tin production was from Taroudji and El Meki mines in the southern Air Mountains.

By yearend 1975, a mixed private and public company, Société Niger Charbon (SONICHAR), was established to exploit the coal deposits at anou-Ararene. Reserves of these deposits were estimated at 4.5 million tons. However, the economics of exploiting the deposits and the opening date were not available by yearend.

Petroleum exploration by several foreign firms including four U.S. companies, after

[51] Prepared by E. Shekarchi.
[52] Where necessary, values have been converted at a rate of CFAF224.5=US$1.00.

an investment of approximately $50 million, practically ceased by yearend 1975. Although some indication of petroleum was reported by companies active in 1974 and 1975, fields had yet to be proven exploitable. The companies had halted their drilling activities during the year. apparently to evaluate seismic data, as well as logs from drilled holes. Reportedly some new phosphate deposits were found in the Parc W game reserve by a French exploration group in 1975. Preliminary resources were estimated at 100 million tons with no specific grade. An agreement was signed between the Niger Government and a group of French companies for further study of the phosphate deposit and possibly for an exploration scheme. The details of agreement and sharing of the investment venture were not available.

Cement production decreased 14% in 1975 compared with the 1974 output. Although the rated capacity of the cement factory was 40,000 tons, it was never reached in 1975 owing to shortage of energy. Except for energy, the raw materials for cement manufacturing were supplied indigenously.

RWANDA [53]

Rwanda's mineral production increased in both quantity and value and provided 15% of the country's export sales in 1975. Cassiterite (tin ore) continued to be the principal mineral product and was the second largest source of foreign exchange earnings. Several factors combined to increase drastically the cost of transporting supplies to and exports from the small, landlocked nation of Rwanda. Civil unrest in Angola disrupted and, in August, halted traffic via the Benguela Railway to the Atlantic port of Lobito. Zaire's transport requirements exceeded the capacity of road, rail, and river carriers on two alternative routes to its port of Matadi, and Rwanda's consignments moved slowly when spare capacity was available.

Transport through Uganda to Kenya's Indian Ocean port of Mombasa was unreliable and the Ugandan frontier was at times unpredictably closed. China provided funds for tarmac surfacing of the road from Rwanda's capital, Kigali, to the Tanzanian border, but the connecting road to a railhead in Tanzania was incomplete at the yearend and this route to the east coast port of Dar es Salaam was seldom used.

Transport delays increased the delivered cost of petroleum products, and shortages of gasoline and diesel fuel caused intermittent stoppages of both mining machinery and transport vehicles. The resultant escalation of production costs largely offset the advantages of higher prices of export commodities in the world markets. Dispatch of most of Rwanda's mineral products by air freight obviated transport delays and provided rapid returns of foreign exchange credits.

Most of Rwanda's mineral industry was controlled by the Société Minière du Rwanda (Somirwa), 49% owned by the Government of Rwanda. The Compagnie Géologique et Minière des Ingenieurs et Industríals Belges (GEOMINES) held the remaining 51% and was responsible for operations at the mines.

Cassiterite continued as the chief mineral product and had an export value of approximately $5 million.[54] Société Général des Mines (SGM) purchased the entire production of more than 2,000 tons, and smelted approximately 1,400 tons at its plant in Hoboken, Belgium. The remainder, which contained excessive arsenic, was resold to consumers in other countries.

Tungsten ore (wolframite-ferberite) was Rwanda's fifth-ranking export commodity. Ore production increased 22% from nearly 530 tons in 1974 to nearly 650 tons in 1975. In December 1975, Somirwa absorbed the larger of two tungsten mining operations and became responsible for 90% of Rwanda's tungsten production. The remaining 10% was produced by Mines de Bugarama but marketed through Somirwa. Production of columbite-tantalite by Somirwa increased about 22% to more than 45 tons in 1975.

A methane gas recovery pilot plant on Lake Kivu provided a domestic source of energy and supplied a local brewery with part of its fuel requirements.

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[53] Prepared by Miller W. Ellis.

[54] When necessary, values have been converted from Rwandan francs (RwF) to U.S. dollars at the rate of RwF91 = US$1.00.

Table 10.—Rwanda: Foreign trade in mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
EXPORTS		
Beryl, ore and concentrate	60	77
Columbite and tantalite, ore and concentrate	32	35
Tin, ore and concentrate	2,018	1,883
Tungsten, ore and concentrate	721	661
Other minerals, n.e.s	--	(1)
IMPORTS		
Aluminum, metal, all forms	37	3
Cement	15,204	15,531
Clays, manufactured products	138	113
Copper metal, all forms	1,343	1
Fertilizers, unspecified	2,732	2,290
Iron and steel metal, unwrought and semimanufactures, all forms	3,032	6,088
Lead metal, all forms	(1)	4
Petroleum refinery products:		
Aviation gasoline thousand 42-gallon barrels	2	3
Motor gasoline do	77	78
Kerosine do	38	37
Distillate fuel oil do	59	61
Unspecified do	14	12
Total do	190	191
Salt	4,760	11,537
Other:		
Metals, n.e.s	(1)	(1)
Nonmetals, n.e.s	87	162

[1] Less than ½ unit.

SAÕ TOMÉ AND PRINCIPE [55]

These Portuguese islands became the independent Democratic Republic of Saõ Tomé and Principe in July 1975. With a total area of less than 1,000 square kilometers and less than 80,000 inhabitants, it was the smallest of African nations. The two islands are about 150 kilometers apart and are aligned approximately 250 and 400 kilometers southwest of the Equatorial Guinean Province of Fernando Po. Of volcanic origin and with 1 to 7 meters of annual rainfall, the islands had no mineral exports. The mineral industry was probably limited to the production of stone and other material for local construction. The chief exports were cocoa, coffee, and palm products via ships on the Portugal-Angola run, but this transport service ceased with independence. The departure of most of the Portuguese technicians and supervisors also affected the country's economy. Foreign aid, the acquisition of coastal freighters (promised by Portugal), the development of a fishing industry, and other measures were under consideration for establishing economic stability for the new nation.

SENEGAL [56]

The production and export of phosphates was the dominant mineral industry activity in Senegal during 1975. Calcium phosphate production increased 9% over that of 1974 to nearly 1.6 million tons although exports fell 17% to 1.3 million tons. Aluminum phosphate production decreased to 201,000 tons and exports to 150,000 tons, declining 50% and 29% respectively, below 1974 levels. Poor farming conditions in Europe and lower world phosphate prices were the cause of the decrease in foreign sales of phosphate rock and its products. The 1975 production of attapulgite (fuller's earth) increased 70% to 16,700 tons; cement, 8% to 359,000 tons; and solar evaporated sea salt, 10% to 165,000 tons. Building stone, crushed basalt, sand, and gravel were produced for local consumption.

The value of phosphate rock and its products exported in 1975 was approximately $93.7 million, or 27.5% of the value of Senegal's total exports. Phosphate mining contributed significantly to the GDP of

[55] Prepared by Miller W. Ellis.
[56] Prepared by David E. Morse.

Senegal, which was $1.27 billion in 1975. Phosphate mining employed nearly 1,500 persons out of over 160,000 nonagricultural workers. The Government of Senegal established a 6-square-kilometer free trade zone near Dakar to stimulate foreign investment in manufacturing facilities.

Two companies mined phosphate rock in Senegal during 1975. Compagnie Sénégalaise des Phosphates de Taiba mined calcium phosphate and the Société Sénégalaise des Phosphates de Thiès produced a natural aluminum phosphate. The high quality of Senegalese phosphate allowed the companies to follow the world trend of raising export prices substantially beginning in 1972. By yearend 1974 they had been able to pay off much of their long-term debt. In January 1975, the Government of Senegal negotiated an agreement with each company to buy 50% of both operations. Payment for the Government's share was to be made out of future earnings. Shareholders in Société Sénégalaise des Phosphates de Thiès were the Government of Senegal (50%), and Société Rhône Progil of France (50%). Shareholders in Compagnie Sénégalaise des Phosphates de Taiba were the Government of Senegal (50%), Bureau des Etudes & Recherches Minières of France (13.5%), International Minerals and Chemicals of the United States (12.3%), Compagnie Financière pour l'Outer-Mer (COMIFER) of France (7.4%), Caisse Centrale de Cooperation Economique of France (5.4%), and other (11.4%).[57]

The Taiba company mined calcium phosphate from two deposits located near Tivaouane and had a capacity of 1.65 million tons per year with a planned capacity of 1.8 million tons per year by 1980. Proven reserves at yearend 1975 were 30 million tons with an additional 90 million tons proven reserve at the contiguous Tobène deposit. Value of export sales from the Taiba mine was over $90 million in 1975, a 22% drop from that of 1974, although net profits increased 25% over those of the preceding year. The product exported was powdered 82% calcium phosphate and was shipped to 15 countries, with about 24% going to France, 18% to the United Kingdom, 14% to Greece, 9% to the Netherlands, 17% to other European countries, and the rest to the Americas and India.

The Société Sénégalaise des Phosphate de Thiès mined natural calcium aluminum phosphate from the Pallo mine north of Thiès and had an annual capacity of over 400,000 tons in 1975. The ore was crushed, screened, and either calcined at Lam-Lam near the mine or at Nante in France to increase the P_2O_5 content to 34%. This product when sold for fertilizer purposes was called Phosphal. Some of the calcined product was used to manufacture an animal feed supplement called Polyfos. Value of 1975 exports from the Pallo mine dropped to $3.59 million from $4.87 million in 1974.

A new 50/50 intergovernment company, Société Irane Sénégalaise des Petrols et des Mines (IRANESCO), was formed between Iran and Senegal in 1975. IRANESCO was to develop the Tobène phosphate deposit, build a new petroleum refinery at Kayar, expand the port facilities at Dakar, and construct a new phosphate fertilizer plant near the mine site. The new mining complex was to produce about 2 million tons per year from the Tobène deposit of which 1 million to 1.5 million tons per year would be purchased by Iran. The proposed 2.5- to 3-million-ton-per-year petroleum refinery at Kayar north of Dakar would be supplied with crude oil by the National Iranian Oil Co. The $100 million expansion of the port at Dakar began in 1975. IRANESCO had the Krupp Engineering group perform a preliminary study of the new mine in relation to the complementary projects. It was planned to have all phases of the project in full operation by mid-1980.

Prospecting for phosphates in the Lac de Guires area of northwestern Senegal and between Bakal and Matam along the Senegal River in the east was begun by BRGM of France in association with United States Steel Corp., Société Sénégalaise des Phosphates de Thiès, and the Government of Senegal. The Government was to own 51% of any mining venture resulting from this work. The areas under consideration were in isolated sections of the country and would require several years for development.

In July 1975, a joint company, Iron Ore Mines of Eastern Senegal (Miferso), was formed. The partners in the company were Krupp of West Germany, Screm of France, Kanematus-Gasho of Japan, and the Senegal

[57] U.S. Embassy, Dakar, Senegal. State Department Airgram A-49, Mar. 30, 1976, enclosure 4 and 5.

Government. Proven iron ore reserves at Miferso's concession included 40 million tons of iron ore with an average grade of 63% and 45 million tons of iron ore averaging 53% iron. Owing to the remoteness of the deposits, commercial development was expected to be several years away. Krupp and BRGM made a feasability study of the 1.2 billion to 1.6 billion tons Falémé iron ore deposits in Senegal Oriental.

The capacity of Senegal's only cement plant, owned and operated by Société Ouest-Africaine des Ciments at Rufisque, was 400,000 tons in 1975. Most of the 1975 production was consumed locally with 23% exported.

Société Prochimat exported about 13,800 tons of attapulgite in 1975, an increase of 36% over that of 1974. Attapulgite was used as a drilling mud in petroleum exploration.

Exports of solar evaporated sea salt produced in western Sine-Saloum were over 110,000 tons in 1975. About 30% of the production, or 50,000 tons, was consumed locally.

The oil refinery at M'Boa near Dakar processed 5 million barrels of crude oil in 1975, a 6% increase over that of 1974. The oil refinery was able to supply local demand in 1975. Countries supplying a significant share of the crude oil imported by Senegal in 1975 were Nigeria, Iraq, United Arab Emirates, and Gabon. All of the production from the proposed oil refinery at Kayur would initially be exported, and as the country's demand for refined oil products increased, some would be used for local consumption.

Petroleum exploratory activity by Shell in 1975 included 1 party—month for seismic marine surveys and less than 1 party—month for land surveys. In September 1975, Shell also terminated drilling on the first well drilled in Senegal since 1972. The dry hole, drilled to 9,300 feet on a marine concession area off the southwest coast of Senegal, was the only exploratory well drilled in 1975. The Shell, Senrex, Pecten Senegal, and Demenix group returned 15,400 square miles of its 28,400-square-mile concession to the Senegal Government during 1975.

Table 11.—Senegal: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys, all forms	12	26
Copper metal including alloys, all forms	665	678
Iron and steel:		
Scrap	11,917	32,587
Ferroalloys	(1)	2
Semimanufactures	604	402
Lead metal including alloys, all forms	189	148
Silver metal including alloys ---troy ounces	23	--
Zinc metal including alloys, all forms	7	1
NONMETALS		
Cement	64,338	92,233
Chalk	3	--
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s.:		
Bentonite	2,079	1,768
Other	38	(1)
Products, nonrefractory	96	9
Diatomite and other infusorial earth	(1)	1
Fertilizer materials:		
Crude, phosphatic ---thousand tons	1,416	1,883
Manufactured:		
Nitrogenous	51	36
Phosphatic	77,715	118,095
Potassic	331	3
Mixed	7,221	870
Ammonia	5	5
Gypsum and plasters	2,006	2
Lime	14	1
Pigments, mineral, including processed iron oxides	r 1	(1)
Salt	100,064	110,314
Sodium and potassium compounds, n.e.s	53	27
Stone, sand and gravel:		
Dimension stone, crude and partly worked	580	726
Gravel and crushed rocks	1,374	4,770
Sand, excluding metal bearing	3	2
Sulfur:		
Elemental, all forms	--	23
Sulfuric acid	94	48
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	--	(1)
Coal	10	5
Petroleum refinery products:		
Gasoline ---thousand 42-gallon barrels	176	288
Kerosine ---do	677	806
Distillate fuel oil ---do	582	382
Residual fuel oil ---do	417	456
Lubricants ---do	30	44
Other:		
Liquefied petroleum gas ---do	13	10
Unspecified ---do	2	14
Total ---do	1,897	2,000
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	1	34

r Revised.
1 Less than ½ unit.

Table 12.—Senegal: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Oxide and hydroxide	--	400
Metal including alloys, all forms	541	567
Antimony metal including alloys, all forms	1	1
Copper:		
Matte	2	1
Metal including alloys, all forms	59	117
Gold metal, unworked or partly worked troy ounces	584	64
Iron and steel:		
Ore and concentrate	(1)	--
Metal:		
Scrap	272	339
Pig iron, ferroalloys, primary steel forms	7	26
Semimanufactures	r 41,356	53,894
Lead:		
Oxides	36	35
Metal including alloys, all forms	20	19
Manganese oxides	1	30
Nickel metal including alloys, all forms	5	8
Platinum-group metals including alloys troy ounces	(1)	7
Silver metal including alloys thousand troy ounces	106	80
Tin metal including alloys, all forms	24	20
Titanium oxides	132	88
Zinc:		
Oxide	40	37
Metal including alloys, all forms	25	15
Other:		
Oxides, hydroxides, and peroxides of metals, n.e.s	35	105
Metals, metalloids	7	9
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	4	1
Grinding and polishing wheels and stones	19	20
Asbestos	1,262	794
Barite and witherite	32	20
Boron materials:		
Crude natural borates	315	56
Oxide and acid	3	3
Cement	22,814	1,498
Chalk	1,512	1,932
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s.:		
Bentonite	1,459	1,543
Kaolin	65	74
Other	168	166
Products:		
Refractory (including nonclay bricks)	957	917
Nonrefractory	1,091	1,992
Diatomite and other infusorial earth	32	33
Fertilizer materials:		
Crude, phosphatic	3	--
Manufactured:		
Nitrogenous	4,864	4,346
Phosphatic	660	100
Potassic	10,492	12,709
Other, including mixed	2	3
Ammonia	11,620	10,265
Graphite, natural	7	15
Gypsum and plasters:		
Gypsum	8,528	1,438
Plasters	529	473
Mica, all forms	2	2
Pigments, mineral:		
Natural crude	98	135
Iron oxides, processed	59	89
Precious and semiprecious stones, except diamond:		
Natural kilograms	12	--
Manufactured do	30	--
Salt	78	75
Sodium and potassium compounds, n.e.s	5,330	4,725
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	221	60
Worked	254	199
Dolomite	2	--
Gravel and crushed rock	64	51

See footnotes at end of table.

Table 12.—Senegal: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Stone, sand and gravel—Continued		
Quartz	30	--
Sand, excluding metal bearing	88	31
Sulfur:		
Elemental:		
Other than colloidal	11	10
Colloidal	23,789	26,951
Sulfuric acid	50	37
Talc, steatite, soapstone, pyrophyllite	225	193
Other nonmetals, n.e.s.:		
Crude ores and concentrates	125	229
Oxides and hydroxides of barium, magnesium, strontium	(1)	--
Bromine, iodine, fluorine	133	144
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	49	370
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	(1)	--
Carbon black	37	69
Coal, all grades, including briquets	55	66
Coke and semicoke	316	625
Peat	20	1
Petroleum:		
Crude ......thousand 42-gallon barrels	4,930	5,066
Refinery products:		
Gasoline ......do	26	48
Kerosine ......do	1	2
Distillate fuel oil ......do	78	97
Residual fuel oil ......do	(1)	4
Lubricants ......do	65	86
Other:		
Liquefied petroleum gas ......do	1	4
Mineral jelly and wax ......do	5	8
Bitumen and other residues ......do	24	26
Bituminous mixtures, n.e.s ......do	11	10
Total ......do	211	285
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	584	638

r Revised.
1 Less than ½ unit.

SOMALIA [58]

The mineral industry of Somalia was largely confined to the production of meerschaum, marine salt, local building materials, and small amounts of tin. No production or detailed trade figures were available. All fuel needs were imported and were valued at $14 million[59] for 1974; data for 1975 petroleum imports were not available. Total imports in 1975 were valued at $144 million and total exports at $72 million, leaving a negative trade balance of $72 million. Foreign aid and grants, mostly from East European and Arab donors, however, more than compensated for the trade gap. These foreign inputs were for the most part motivated by the drought.[60] Prices remained relatively stable, increasing about 8% in 1975.

As partial fulfillment of the bilateral agreement for economic and technical assistance signed in June 1975 by the U.S.S.R., 72 Soviet specialists were working on the 5,000-kilowatt hydroelectric project on the Juba River. Soviet assistance, in general, was to be aimed toward enabling Somalia to fulfill its second 5-year development plan (1974–78). The Italian firm Citaco S.p.A. completed a preliminary study of the Scebeli River dam project in 1975. The United Arab Emirates were to lend $40 million for constructing a dam at Bardera. The 158-kilometer Harguisa-Berbera road was officially opened in June 1975. This highway construction, which began in

[58] Prepared by Janice L. W. Jolly.
[59] Where necessary, values have been converted from Somalian shillings (Ss) to U.S. dollars at the rate of Ss6.2950=US$1.00.
[60] American Embassy, Mogadiscio, Somalia. Department of State Foreign Economic Trends and Their Implications for the United States. No. 76-132, November 1976, 9 pp.

1972, was financed by a $9.2 million loan from the IDA and a $1 million loan from the ADB. Ground was broken on October 16, 1975, at Suria Malableh for construction of a cement plant utilizing nearby gypsum deposits. The $12 million project was financed jointly by the North Korean and Somalian Governments. The gypsum deposits were estimated at 7 million tons.

The UNDP was to begin strengthening the Somali Geological Service in mid-1976. Mapping, groundwater survey, and mineral exploration were to be consolidated, and improvements were to be made in chemical, mineralogical, and cartographic facilities. The UNDP was also to further pursue the investigation of the Mudugh carnotite deposits, which were found by a UNDP project that ended in 1974. The Somali Government was also actively seeking potential foreign investors for extraction of this uranium in cooperation with the Government. Both western and eastern block investors were being considered. Ilmenite sands described by the UNDP at Chismaio were estimated at 10 million tons with an average content of 1.0% TiO_2.

A Bulgarian geological team was doing systematic exploration including mapping, drilling, and sampling in the Majayahn-Dalan area of Bosaso Province in northeast Somalia. Tin was reportedly being produced from placer deposits at Dalan and the pegmatite and quartz veins at Majayahn. At Majayahn, an ore dressing plant produced about 80 tons of cassiterite concentrate averaging 55% tin. About 100 tons of concentrate was shipped to Bulgaria for testing and processing. Development of tin mining was made possible by a $1.5 million Bulgarian loan made in 1972.

Small low-grade iron ore deposits were also located (120 million tons grading 35% iron) at Bur Gulan, and 50 million tons, at Dinsor. Nickel, chrome, lead, zinc, and piezoelectric quartz in northern Somalia have also been described. Reportedly, sepiolite and bentonite deposits occur near El Bur in central Somalia.

An Italian company was to begin construction in 1976 on a petroleum refinery with a 10,000-barrel-per-day capacity. The refinery was to be Iraqi financed and to take 2 years to complete. At the beginning of 1975, companies holding oil exploration permits included Elf-Exxon, Elf-Exxon-Aquitaine, CONOCO-Shell-AGIP, and Deutsch Texaco in the northern coastal areas of Somalia; and Burmah Oil, Texaco, and Elf-TOTAL in the southern part of the country. CONOCO was operating two airplanes and three helicopters in its concession, employing nearly 300 people. Under its agreements with the Government, CONOCO reportedly[61] was to give Somalia a 15% royalty on production, plus a 45% tax on profits. By yearend, however, CONOCO had announced intentions to withdraw, leaving only one U.S. firm, Exxon, retaining an interest in petroleum prospecting in Somalia. The Burmah Group had also withdrawn.

SPANISH SAHARA[62]

The principal mineral production in Spanish Sahara during 1975 was phosphate rock. Fosfatos de Bu-Craa, S.A. (Fosbucraa), a wholly-owned subsidiary of the Spanish Government's Instituto Nacional de Industria, operated the province's only major mine at Bu-Craa in northern Spanish Sahara, about 100 kilometers southeast of El Aaiun. In 1975, this mine produced 2.76 million tons of phosphate rock for export with a value of approximately $170 million. The ore was crushed at the mine and transported by conveyor to El Aaiun where it was washed with seawater to wet and separate the sands and slimes from the phosphate bearing nodules. The nodules were then washed with freshwater and dried to yield a product grading 34% to 37% P_2O_5. Phosphate exports from El Aaiun were loaded from a 3,200-meter-long pier with berths for three 100,000-ton ore carriers.

The production capacity of the mine was 5.6 million tons annually in 1975; however, output was limited by the freshwater supply at the beneficiation facility at El Aaiun. Proven reserves of phosphate rock at Bu-Craa were 1.7 billion tons with an additional 10 billion tons of probable ore. Nearly all of the 1975 production was exported to Spain, West Germany, and Japan.

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[61] Rocky Mountain News (Denver, Colo.). Denver Native in Middle of Hunt for Oil in Somalia. Apr. 23, 1975, p. 3.

[62] Prepared by David E. Morse.

In October 1975, Spanish Sahara's northern neighbor, Morocco, staged an unarmed "march of conquest" into the province, which resulted in Spain relinquishing control of the territory; subsequently, Morocco's Office Cherifen des Phosphates (OCP) acquired a 65% interest in the Bu-Craa mine with 35% retained by Fosbucraa. The mine continued to operate with a Spanish staff until it was closed down in mid-December; however, OCP planned to reopen the mine using Moroccan personnel in early 1976. The conveyor system was also shut down owing to damage caused by sabotage to five sections. Repairs to the conveyor were scheduled to be completed by the spring of 1976. The loading facility's capacity at El Aaiun was reduced when part of the pier was damaged by a freighter ramming it on December 15, 1975.

No oil exploration activity was carried out in 1975.

SUDAN [63]

The mineral industry of Sudan was a minor contributor to the nation's economy in 1975, although plans were made for the exploitation of Sudan's promising mineral potential. The mineral sector, which was limited to the exploitation of chromite, small-scale gold and mica mining, a salt industry, the quarrying of gypsum and limestone for use in cement manufacture, and the refining of petroleum products, accounted for approximately 2% of the 1975 GDP of $2.8 billion.[64] Sudan continued to evidence a severe balance of payments deficit, approximately $400 million in 1975, due to increased outlays for food and petroleum imports, which increased from $106 million in 1974 to $265 million in 1975, and large imports of capital goods in support of an ambitious development program. Spending on development projects more than quadrupled since 1973, and the Government was embarking on a $6.5 billion, 6-year development plan to be financed largely by Arab donors who pledged $5.7 billion over the next 10 years. The Geologic and Mineral Resources Department formulated a long-range development plan that included a major increase in cement industry capacity, a new petroleum refinery, further development of chromite, gold, and gypsum mining, and the exploitation of iron ore, asbestos, and copper deposits.

A major focus of investment was the effort to rectify the infrastructural problems of inadequate transport, communications, and electricity, which constituted key obstacles to Sudan's development. As the largest nation in Africa, Sudan's 2.5-million-square-kilometer area was serviced by 5,000 kilometers of railway, which transported the bulk of both passengers and commodities. Financed by a $24 million loan from the IDA, the Sudan Railway was to be modernized and capacity increased from 2.2 million to 3.6 million tons in 1976, and eventually to 4 million tons. During the year, a contract was signed with a French consortium, Francorail-Materiel de Traction Électrique (Francorail-MTE) for construction work including the addition of new tracks, improvement of existing rail links, modernization of the signaling system, and upgrading of rolling stock.

The Sudanese Corp. of Public Works continued its wide-scale road construction program, financed by the United Kingdom, China, and Arab sources in conjunction with the ADB. The existing system comprised 19,000 kilometers of roads, which were to be supplemented by 1,600 kilometers of new highway. The 996-kilometer road linking Port Sudan with Khartoum was to be completed in 1978. Construction began during the year on a 187-kilometer road connecting Debeibat, Dilling, and Kadugli in Southern Kordofan Province. At yearend, an important agreement was signed between Sudan and Kenya to construct a road between Juba and Kitale in Kenya, which would give southern Sudan direct access to the port of Mombasa. In providing an alternative transport route to the longer and less reliable route through Khartoum and Port Sudan, the new road was to be an important development asset to Sudan's southern region.

At Port Sudan, studies were being conducted for the modernization and expansion of port facilities with technical

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[63] Prepared by Candice Stevens.
[64] Where necessary, values have been converted from Sudanese pounds (£S) to U.S. dollars at the rate of £S1=US$2.87.

assistance from the United Kingdom. In addition, West Germany was aiding in drafting plans for the construction of a new port at Suakin, 50 kilometers south of Port Sudan. The port, which was to have an initial capacity half of that of Port Sudan, was to be completed in 1980 at a cost of $37 million.

A $40 million program was to provide Sudan with additional electrical facilities over a 5-year period. The bulk of electric power generation and consumption was concentrated in the central part of the country, where the Public Electricity and Water Corp. operated its Blue Nile grid based on five generating stations. Total power-generating capacity in 1975 was 208 megawatts, of which 108 megawatts was hydropower. The generating capacity of the Blue Nile grid was to be increased by 55 megawatts, and diesel units were to be installed at Port Sudan, Juba, Atbara, El Obeid, Bari, and Geda.

Cement production in 1975 fell to approximately 140,000 tons owing to technical difficulties that left Sudan's two cement plants operating at half capacity. At the same time, Sudan's development program increased cement requirements and necessitated the importation of 77,000 tons of cement in 1975, primarily from Japan, West Germany, Kenya, Italy, and the United Kingdom. However, a scheduled improvement and expansion of facilities was to convert Sudan from an importer to an exporter of cement with the eventual annual production goal set at 1.5 million tons. The Maspion Cement Corp., situated at Atbara in Nile Province, failed to reach its production target of 225,000 tons owing to electric power shortages. This was to be remedied by the installation of a new diesel generator, and a contract was also signed with the Danish firm F. L. Smidth for the design, supply, and erection of a new production line. The Nile Cement Co. at Rabak in White Nile Province was to reach a production capacity of 120,000 tons by 1977. Contracts were signed with West German firms for the expansion. A third cement plant was under construction by the Arab Cement Co. Ltd. at Derudeb in Red Sea Province. The plant, a joint venture of the Sudanese Government, the Kuwait Foreign Trading and Investment Co., and Lazard Brothers of London, was scheduled for startup in 1980 with an annual capacity of 500,000 tons. Of three other proposed cement projects, the most promising was a combined American-Sudanese undertaking to build a 400,000-ton plant at a site north of Port Sudan. A feasibility study was conducted by Klockner Industrie Anlagen for a 100,000-ton plant at Kapoeta in Equatoria Province to provide cement for the southern region. Another proposal was the construction of a cement plant at Damazin in Blue Nile Province with a 100,000-ton capacity.

Sudan continued negotiations for 50% ownership in the Port Sudan Shell and British Petroleum (Sudan), Ltd., refinery in Port Sudan. In 1975, the Public Petroleum Corp., responsible for the supervision of the Government's interest in oil production, refining, and internal distribution, imported approximately 8 million barrels of crude oil from Iran, Iraq, and Kuwait for processing at the 22,000-barrel-per-day refinery. Construction continued at the 200,000-barrel-per-day refinery being built at Port Sudan by the Sudanese Government and the Saudi Arabian firm Triad Naft. An 815-kilometer pipeline linking Port Sudan with Khartoum was to be completed in mid-1976. Work was being done by the West German firm Sodrobrau and the United Kingdom firm Macklebane. The pipeline, which was to have a daily capacity of 12,000 barrels, was financed by the Kuwait Investment Co.

The discovery of natural gas in the Red Sea was a promising sign as prospecting for oil and gas continued during 1975. Five companies held exploration licenses covering 58,500 square kilometers offshore and 500,000 square kilometers onshore. In October 1975, the Sudanese Government signed exploitation agreements with the operating companies whereby the firms would recover their costs over a 5-year period through partial ownership of any commercial discovery, after which the Government would assume full ownership. Chevron Overseas Petroleum, Inc., a subsidiary of Standard Oil of California, and Texaco Sudan, Inc. were the operators for various partnerships. In a 2,500-square-kilometer offshore concession shared with American Pacific International, Inc., Chevron-Texaco drilled the 1A Bashayer well, which tested at a rate of 9.5 million cubic feet per day of gas. In one of 39 tracts covering 29,000 square kilometers, Chevron-Texaco was to undertake drilling the 1 Suakin wildcat about 40 kilometers off the Sudanese coast. Two other offshore license holders conducted preliminary seismic work during the year. Chevron-Texaco was the operator for Ball and Collins (Oil and Gas) Ltd., which held 17 onshore and offshore exploration permits. The Sudanese Resources Development Corp., a subsidiary of Oceanic Exploration Co., held 18 offshore licenses covering 14,500 square kilometers. Chevron also held exploration permits for an extensive area in the south and southeast interior that was being surveyed by Hunting Geology and Geophysics of the United Kingdom.

Approximately 20,000 tons of chromite was mined in the Ingessana Hills in southeast Blue Nile Province. Both the Government-owned Ingessana Hills Mines Corp. and the privately-owned Blue Nile Chromium Ltd. shipped their production through the Damazin railhead to Port Sudan for export. Production of chromite began in 1963 from open pits, which continued to operate in addition to one underground mine. In 1975, the Sudanese Government announced plans to double production capacity from 25,000 to 50,000 tons per year over the next 2 years. Since early 1974, Sudan's chromite resources have been the subject of a surveying and mapping program by a geologic team from China, which indicated the existence of 133 new chromite occurrences. Total reserves in the Ingessana Hills and also at Qala en Nahl in Red Sea Province and Sol Hamed in the north were estimated at 2 million to 4 million tons averaging 50% Cr_2O_3. During the year, the Sudanese Government began negotiations with Japanese firms for the development of chromite mining in the eastern part of the country and the construction of a ferrochrome plant.

Gold mined at the Gebeit mine in the Red Sea Hills and from smaller alluvial deposits totaled about 300 troy ounces in 1975. During the year, an agreement was signed with the United Kingdom firm Robertson International Co. for the study of gold deposits in the Serakoit region of the Red Sea Hills. The survey, which was to be completed in 1976, was to include an evaluation of the ore, a determination of means for gold extraction, and specifications and designs for required machinery.

Approximately 15,000 tons of gypsum was mined for local use in cement manufacture and other construction purposes. Gypsum deposits in three districts along the Red Sea coast north of Port Sudan were estimated to contain 92 million tons. The Red Sea Gypsum Mining Co. was reported to be conducting a feasibility study for the expansion of gypsum mining in the area. Other minerals produced in 1975 were 66,000 tons of salt from the saltworks near Port Sudan, and 250 tons of mica from a model project in the Shereik area of Northern Province.

Sudan once again invited bids for the construction of its long-planned chemical fertilizer complex at Port Sudan. Cremer and Warner (United Kingdom) were the original consultants on the project, which was to include a 450-ton-per-day ammonia plant and 650-ton-per-day urea plant. Plans called for the fertilizer complex to be completed in 1978 at an estimated cost of $30 million.

The assessment of Sudan's mineral resources continued during 1975 with assistance from West Germany, France, China, and the U.S.S.R., and a number of new exploration agreements were concluded. The United Nations Revolving Fund for Natural Resources Exploration was to finance a project for the exploration of copper, gold, and other minerals in the Sabidana Hills of Red Sea Province. A total area of 750 square kilometers was to be surveyed over a period of 1 to 2 years at a cost of $400,000 to $500,000. Sudan also concluded an agreement with West Germany to explore for copper, tin, mica, and other minerals in the Baiyuda Desert in Northern and Nile Provinces. The U.S.S.R. continued its study of a 75,000-square-kilometer area in Red Sea Province that focused on the identification and evaluation of iron ore deposits. Estimated reserves in three Red Sea districts were 13.5 million tons of ore with an average iron content of 40% to 50%.

An agreement was signed between the Sudanese Government, Johns-Manville Co. Ltd. (Canada), and Gulf International Corp. for a feasibility study of asbestos deposits in the Jibal and Qala en Nahl areas. Initial exploration by the Geologic and Mineral Resources Department outlined reserves of 20 million tons of asbestos ore in the Jibal District, and total deposits in the area were believed to contain 60 million tons.

AGIP was granted a license in November 1975 for uranium exploration in the Nuba Mountains of Southern Darfur Province. Gulf International Corp. and Westinghouse also signed a contract for preliminary uranium exploration in North Darfur and Red Sea Provinces. Exploration was to begin in mid-1976 for a period of 6 months, following which their findings were to be submitted to the Sudanese Government.

A Sudanese agreement with the West German firm Preussag AG for the exploration of minerals on the Red Sea bed was abrogated during the year. The newly formed Joint Sudanese-Saudi Arabian Commission for the Exploitation of Red Sea Resources was to enter into negotiations with various firms for geologic studies of the seabed. Previous exploration in 1968 indicated the existence of gold, silver, copper, zinc, and manganese mineralization in deposits at a depth of 7,000 feet midway between the Arabian peninsula and Sudan.

Table 13.—Sudan: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Copper metal including alloys, scrap	10,509	270
Iron and steel metal, scrap	3,927	4,313
Lead metal including alloys, scrap	238	100
Manganese ore and concentrate	369	--
Zinc metal including alloys, scrap	34	--
Other:		
Ore and concentrate of base metals, n.e.s	5,000	20,000
Nonferrous metal scrap, n.e.s	1,563	--
Precious metal scrap ____troy ounces	2,058	--
NONMETALS		
Cement	37	--
Clays, crude	--	3
Salt	346	81
Sodium carbonate, natural	37	17
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline ____thousand 42-gallon barrels	3	(1)
Kerosine ____do	(1)	--
Jet fuel ____do	164	20
Distillate fuel oil ____do	--	3,017
Residual fuel oil ____do	134	192
Lubricants ____do	2,127	2,107
Total ____do	2,428	5,336

[1] Less than ½ unit.

Table 14.—Sudan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Oxide and hydroxide	--	9
Metal including alloys, unwrought and semimanufactures	r 1,484	1,188
Copper metal including alloys and semimanufactures	244	686
Iron and steel metal:		
Pig iron, ferroalloys, similar materials	164	1,559
Steel, primary forms	14	5,858
Semimanufactures:		
Bars, rods, angles, shapes, sections	45,455	38,294
Universals, plates, sheets	31,442	26,726
Hoop and strip	4,843	4,156
Rails and accessories	214	359
Wire	12,064	518
Tubes, pipes, fittings	5,781	5,527
Castings and forgings, rough	62	297

See footnotes at end of table.

Table 14.—Sudan: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS—Continued		
Lead metal including alloys, unwrought and semimanufactures	r 301	440
Nickel metal including alloys, unwrought and semimanufactures	6	9
Silver troy ounces	6,591	--
Tin metal including alloys, unwrought and semimanufactures	r 848	356
Zinc metal including alloys, unwrought and semimanufactures	773	66
Other:		
Oxides, hydroxides, peroxides of metals, n.e.s	684	72
Base metals, including alloys, all forms n.e.s	3	4
Oxides of zinc and lead, not separated	90	138
Oxides of manganese, iron, cobalt, titanium, not separated	531	480
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	113	159
Dust and powder of precious and semiprecious stones	21	22
Grinding and polishing wheels and stones	94	78
Asbestos	6	--
Cement	6,470	4,535
Chalk	826	24
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	326	718
Products:		
Refractory (including nonclay bricks)	734	1,186
Nonrefractory	75	132
Fertilizer materials:		
Crude, phosphatic	30	25
Manufactured:		
Nitrogenous	178,395	245,826
Phosphatic	787	NA
Ammonia	91	36
Graphite, natural	3	58
Gypsum and plasters	300	194
Lime	1,486	540
Mica, crude, including splittings and waste	r 2,216	--
Pigments, mineral, natural crude	481,292	343,538
Salt	28	NA
Sodium carbonate, natural	347	--
Sodium and potassium compounds, n.e.s.:		
Caustic soda	8,194	5,325
Caustic potash, sodic, potassic peroxides	2	5
Stone, sand and gravel:		
Dimension stone value	r $77	$6,174
Sand, excluding metal bearing	51	50
Sulfur:		
Elemental, all forms	179	322
Sulfuric acid	299	797
Other nonmetals, n.e.s.:		
Crude	83	294
Bromine, chloride and fluorine	75	42
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals n.e.s	2,754	2,606
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	366	7,315
Carbon black	34	3
Oxygen, nitrogen, hydrogen, rare gases	10	13
Petroleum refinery products:		
Gasoline:		
Motor thousand 42-gallon barrels	r 936	905
Aviation do	224	78
Kerosine do	583	482
Distillate fuel oil do	2,619	2,733
Residual fuel oil do	1,351	1,364
Lubricants do	179	147
Other:		
Liquefied petroleum gas do	37	24
Mineral jelly and wax do	2	634
Bituminous mixture, n.e.s do	43	45
Unspecified do	(1)	--
Total do	5,974	6,412
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	265	4

r Revised. NA Not available.
1 Less than ½ unit.

SWAZILAND [65]

The mineral industry continued to be an important factor in Swaziland's general economic growth, and contributed to a 6% increase in the country's GDP, from $184 million[66] in 1974 to $195 million in 1975. Asbestos and iron ore dominated mine production, comprising 95% of the total value of mineral sales. Minerals produced were asbestos ($12.3 million), iron ore ($10.8 million), coal ($965,000), granite ($220,000), kaolin ($32,000), barite ($7,000), and tin ($3,000). Asbestos and iron ore, the two main export minerals, accounted for approximately 13% of total export receipts, which reached $183 million in 1975. Swaziland's greatly increased export earnings resulted in an overall balance of payments surplus of $51 million in 1975.

Swaziland's monetary, exchange rate, and economic policies remained closely intertwined with those of the Republic of South Africa. This was reinforced by Swaziland's membership, with Lesotho and South Africa, in the Tripartite Rand Monetary Area, and in the four-nation South African Customs and Currency Union, which included Botswana, Lesotho, and the Republic of South Africa. In 1975, approximately 90% of Swaziland's imports came from the Republic of South Africa. Imports of refined petroleum products, predominantly from the Republic of South Africa, were valued at approximately $14.5 million, or about 13% of total import value.

Discussions continued between the Swaziland Government and the IBRD regarding construction of a large thermal power station based on domestic coal resources. In 1975, generating capacity of the Swaziland Electricity Board (SEB) was limited to small hydro and diesel units producing about 20 megawatts, with additional power purchased from the Electricity Supply Commission of South Africa (ESCOM). The proposed project was initially to consist of two 100-megawatt generators powered by coal from a new mine with a 384,000-ton-per-year capacity to be developed near Mpaka. Plans called for the entire electric power output to be purchased by ESCOM and integrated into the South African grid system, with Swaziland buying back requisite power at cost. The Government of the Republic of South Africa was to partially finance the project through a long-term loan of $40 million.

The production of iron ore at the Ngwenya mine, situated 25 kilometers northwest of Mbabane, remained at the 1974 level of 2.2 million tons. The Swaziland Government held a 20% interest in the mine, which was operated by the Swaziland Iron Ore Development Co. (SIODC), a subsidiary of the Anglo American Corp. The entire production was railed 298 kilometers to the port of Maputo (formerly Lourenço Marques) in Mozambique for export. Except for small shipments to the Netherlands, iron ore was exported exclusively to Japan under a long-term contract. Swaziland's rail freight costs, which increased substantially due in part to irregularities in shipments through Mozambique, were a critical factor in renegotiating a supply agreement with Japanese steel mills. Upon the completion of a 10-year high-grade iron ore contract in mid-1975, a 3-year contract for 2 million tons per year of medium-grade ore (minimum 60% Fe) was concluded. SIODC was expected to discontinue operations at the Ngwenya mine during 1978 after stockpile depletion.

The evaluation of Swaziland's low-grade iron ore continued during 1975. Low-grade ores are found chiefly in the northwest highlands between Ngwenya and Hoho and in the south between Gege and Maloma. Total reserves were estimated at 576.4 million tons with an average 34.2% iron. However, preliminary laboratory investigation of samples obtained by drilling several formations indicated that iron content, average grain size, and beneficiation and transport factors mitigated against exploiting the deposits in the near future.

The export value of asbestos surpassed that of iron ore for the first time in 1975. Asbestos production at the Havelock mine, located at Bulembu in the northwest, increased from 32,421 tons in 1974 to 37,600 tons in 1975 despite increasing difficulties in ore extraction at lower mine levels. The major part of output of asbestos fiber was exported from Maputo to the United Kingdom, Ireland, Belgium, Denmark, and Malaysia. The Havelock mine, which

[65] Prepared by Candice Stevens.
[66] Where necessary, values have been converted from Swaziland Emalangeni (E) to U.S. dollars at the rate of E1=US$1.3663.

opened in 1939, was owned 40% by the Swaziland Government and 60% by Turner and Newall, Ltd. (United Kingdom). Discussions were held during the year between Havelock Asbestos Mines (Swaziland), Ltd., which operated the mine, and Lonrho Ltd., concerning the best approach to optimizing reserves in the lower part of the ore body. Lonrho Ltd. held a prospecting concession adjacent to the Havelock mine but reported no new results at yearend.

Although it was indicated that remaining reserves of iron ore and asbestos were limited, Swaziland's minable coal reserves were estimated at 200 million tons. In 1975, production of bituminous coal by Swaziland Collieries Ltd. at Mpaka increased slightly to 126,900 tons. Coal production was used by Swaziland Railways and local industrial and agricultural interests and was exported to Kenya and Mozambique. During the year, Swaziland Collieries proposed the development of a new coal mine to produce low-ash, metallurgical coal for export. The project, which would involve the sale of 371,000 tons of coal per year for approximately 15 years, was to be further evaluated.

New prospecting licenses were issued for the study of Swaziland's coalfields, which extended 150 kilometers in a north-south direction between Bordergate and Pongola. Shell Coal (Swaziland) Ltd. was awarded an 800-square-kilometer tract for exploration for coal, radioactive minerals, and oil shale. To the south of this area, Sir Alfred McAlpine and Son Ltd. was awarded a 260-square-kilometer tract for coal prospecting. A third tract was held by Johannesburg Consolidated Investments (JCI), who was conducting a feasibility study of mining the large anthracite reserves at Maloma. In addition, as part of the preliminary work for the proposed thermal power station, the Swaziland Government assumed the financing of the evaluation of coal reserves in the area around the Mpaka mine.

A fertilizer plant, operated by Swaziland Chemical Industries (Pty.) Ltd., commenced operation at Matsapa at yearend 1975. Initial production of the plant, which manufactured chemical fertilizer from ammonia and phosphoric acid imported from Iran, was to be 1,000 tons per month increasing to 4,000 tons. Output was to be marketed in Swaziland and the Republic of South Africa. Swaziland Chemical Industries was also planning to construct a $3 million phosphoric acid plant at its Matsapa complex, which was to be completed by 1977.

A potential addition to Swaziland's mineral sector was the Piggs Peak gold mine, the reopening of which was under consideration by the Government. The Piggs Peak mine, situated in the northwest corner of the country, was first mined in the early 1880's but has been dormant since 1951. Geological examinations during the year indicated the extension of one of the main veinlets below the old workings, and prompted the dewatering of the lower mine levels and the refurbishing of the main shaft. Although applications from interested companies were invited for working the deposit, the Government planned to complete the assessment of remaining grade and tonnage prior to issuing development permits. Three other gold occurrences were also investigated in 1975, and the initiation of a small gold leaching operation just south of Forbes Reef was planned.

Approximately 780 kilograms of tin concentrates were produced at the Pentoyz mine, owned by R. D. and B. Tin Mine (Pty.) Ltd. As a result of the discovery of workable eluvial tin deposits in 1974, a small-scale tin sluicing operation was set up during 1975. Further evaluation of the deposits, situated north of Kubuta about 6 kilometers west of the Pentoyz mining lease, indicated about 100 tons of cassiterite.

Kaolin production increased slightly from 2,236 tons in 1974 to 2,660 tons in 1975. The mine at Mahlangatsha northeast of Sicunusa was bought in 1974 by the Swaziland Government from Kaolin (Swaziland) Pty. Ltd. Tests were in progress to ascertain the commercial value of lower-grade kaolin reserves in the concession area.

Barite production at the Londosi mine operated by Swaziland Barytes Ltd. declined from 296 tons in 1974 to 200 tons in 1975. Continued drilling at the mine, situated northwest of Mbabane, proved 90,000 tons of salable barite and indicated another 200,000 tons of reserves. A dry beneficiation plant was commissioned and the installation of a flotation plant was proposed.

Approximately 40,700 cubic meters of granite was produced at the Van der Meer quarry and sold for use in the domestic construction industry.

De Beers Consolidated Mines continued prospecting operations for diamond on their Ehlane, Dokolwaya, and Spekboom tracts, which cover an area of over 260 square kilometers. At Ehlane, operations consisted of soil sampling, drilling, trenching, and pitting, while on the other two licenses, operations were confined to soil sampling. De Beers renewed its prospecting rights in 1975 and agreed to spend approximately $5 million on diamond exploration.

Other exploration was conducted by Eland Exploration, which held three prospecting licenses covering an area of 115 square kilometers. In the Elangeni tract, operations were directed toward outlining copper-nickel-cobalt mineralization by means of geochemical prospecting and geological mapping. In the Forbes Reef and Ngwenya areas, the objective of exploration was copper and nickel with associated gold. Activity in 1975 consisted of mapping, trenching, and geochemical soil sampling.

The Swaziland Geological Survey and Mines Department, responsible for the regulation and development of mineral resources, undertook several other investigations during the year. Calcite veins at Nsalitshe were found to contain approximately 5,000 tons of coarse-grained calcite. The preliminary assay showed the material to consist of 97.4% calcite, 1.3% combined iron, magnesium, and aluminum oxides, and 0.9% silica. An occurrence of talc north of Sicunusa was examined and proved to be schist with primary constituents of talc, tremolite, chlorite, and anthophyllite. In addition, testing was conducted on samples of beryl obtained from eluvial workings north of Kubuta. The Department planned to investigate the economic feasibility of developing these mineral deposits as small-scale operations.

TOGO [67]

Since the nationalization of the country's only large industry, the Compagnie Togolaise des Mines du Bénin (CTMB) in early 1974, and the concomitant rise in phosphate sale prices from $16 to $75 per ton,[68] Togo's economic picture changed radically but unevenly. The dramatic rise in foreign exchange holdings resulted in a spending boom and a consequent overstimulated economy characterized by high inflation. In 1975 the economic scene shifted as demand for phosphate rock was down 55%, from 2.6 million tons in 1974 to 1.2 million tons in 1975, owing to overstocking during the previous year. The last quarter of 1975 registered, according to Office Togolaise des Phosphate, phosphate prices at about $50 per ton. The drop in sales coupled with a high rate of government spending throughout 1975 resulted in a significant 80% reduction in foreign exchange holdings and a difficult balance of payments situation.

The construction of the country's only phosphoric acid fertilizer plant at an estimated cost of $200 million, and other facilities that would produce, among other products, 1,000 tons of phosphoric acid, remained at the study stage. Some French firms showed interest in financing and building the plant. The initial capacity of the plant calls for the annual utilization of 1 million tons of phosphate rock as a feedstock.

A joint venture between the Government of Togo, the Ivory Coast, and Ghana to construct a cement plant, Ciments de l'Afrique de l'Ouest (CIAMO), at a cost of approximately $280 million came closer to reality by yearend 1975. The World Bank agreed to participate in financing of the cement project by providing $50 million. The cement plant, with an annual 1.2-million-ton capacity, was to be financed primarily from European sources, and most of the plant's production was to be shared among the three governments.

Construction of a 30,000-barrel-per-day petroleum refinery, located at Tahligbo, financed and built by British firm, was to go onstream by mid-1977. Seventy-five percent of the refinery output was slated for export, mostly to the European market. The balance would be used to fuel the phosphate industry and about 20,000 registered vehicles in the country.

The second 5-year development plan (1971–75) period closed at yearend with generally unfavorable results. Reportedly, only 50% of its declared objectives were

[67] Prepared by E. Shekarchi.
[68] Where necessary, values have been converted at a rate of CFAF255=US$1.00.

accomplished, since the rural sector never recovered from their chronic problems. Although the third (1976–80) plan's objectives were announced more than a year ago, the plan document was not yet released at yearend 1975. The spending ceiling of this plan was given at over $1 billion, and the focus of the plan was on industrialization, expanded communications, and transportation facilities.

After almost 7 years of exploration, the West German firm Uranerzberghau delineated a section of northeastern Togo as the most promising uranium mineralization area of the country. The uranium finds covered an area from Bafilo to Nimatongon and a second area extending from Sokode to Kaude and perhaps to the Bénin border. The company was looking into narrowing the mineralized area to an exploitable target area in the future. Neither type of mineralization nor the grade of ore was given by yearend.

Table 15.—Togo: Foreign trade in selected mineral commodities

Commodity and unit	1973	1974
EXPORTS		
Fertilizer materials, crude, phosphatic ---thousand tons--	2,197	2,580
IMPORTS		
Cement ---metric tons--	141,616	124,922
Lime ---do----	522	592
Salt ---do----	5,224	4,244
Petroleum products:		
Gasoline ---thousand 42-gallon barrels--	202	193
Kerosine ---do----	72	45
Distillate and residual fuel oils ---do----	474	448
Lubricants ---do----	19	15
Total ---do----	767	701

UPPER VOLTA [69]

The mineral industry of Upper Volta was an insignificant factor in the country's economy in 1975, with no mineral products exported during the year and very little produced for local consumption. However, progress was made on the nation's major mineral project, the exploitation of extensive manganese deposits at Tambao. It was hoped that the creation of the necessary infrastructure for this primary venture would stimulate further development of mineral resources in Upper Volta. The Office Général des Projets de Tambao was created in 1974 not only to oversee the manganese project, a related rail link, and energy and water supplies, but also to develop a cement operation at Tin-Hrassan. Other prospective ventures in the mineral sector were the construction of a second cement plant, the exploitation of phosphate deposits, and the reopening of a gold mine that ceased production in 1966.

A new government policy adopted during the year stipulated that the Government of Upper Volta must have a 51% share in all enterprises and joint ventures in the agricultural, industrial, and mining sectors. In general, the economy again evidenced a substantial balance of trade deficit in 1975, but this was more than offset by extensive foreign assistance in the form of loans and grants. Foreign aid, which totaled more than $60 million,[70] was obtained primarily from France, West Germany, Canada, the Netherlands, the United States, China, the EDF, and the IBRD. Approximately $2 million was received from the ADB to alleviate the effects of oil price increases, which considerably widened the balance of trade gap. In 1975, Upper Volta imported approximately 585,000 barrels of refined petroleum products from Venezuela, Curaçao, and the Ivory Coast.

Plans were finalized during the year for exploitation of the manganese deposits at Tambao, situated 300 kilometers northeast

[69] Prepared by Candice Stevens.
[70] Where necessary, values have been converted at the rate of CFAF224=US$1.00.

of the capital Ouagadougou. The Tambao deposit, discovered 17 years ago, was estimated to contain reserves of 13.5 million tons of manganese oxide ore with an average of 54% manganese content and an additional 13 million tons of manganese carbonate ore averaging 48% manganese. The annual extraction rate was projected at 625,000 tons of manganese ore through a surface mining operation. Completion of the project was expected to be in 1980, with development costs set at $30 million.

In 1975, the Société Minière de Tambao was established to finance the development of the Tambao deposits. The major shareholder was the Upper Volta Government, which held 51% equity. Other participants were the Tambao Manganese Reserves Development Co., a consortium of 11 Japanese firms (30%); Union Carbide Corp. of the United States (7%); Exploration and Bergbau (9%); and the Société du Managanese (3%). The foreign partners in the venture were pledged to buy the entire production of the mine in proportion to their shareholdings. This formula provided for the output to be allocated 383,000 tons to Japan, 115,000 tons to West Germany, 89,000 tons to the United States, and 38,000 tons to France per year.

The Tambao mine development costs took second place to the financing of a railroad link with the Regie des Chemis de Fer Abidjan-Niger railroad system terminating at Ouagadougou. The cost of the 340-kilometer railroad, which would provide a continuous linkage from Tambao to the port city of Abidjan in the Ivory Coast, was set at approximately $114 million. This included the cost of construction, the purchase of locomotives, the development of supporting facilities, and a 10%-per-year reevaluation rate until 1979. An international group of donors pledged varying amounts for the financing of the project, and the Upper Volta Government was to assume the balance of the costs. This consortium included France ($23 million), the EDF ($18 million), Japan ($15 million), West Germany ($15 million), Kuwait ($14 million), the ADB ($13 million), and the Arab Bank for Economic Development in Africa ($10 million). In August 1975, the Upper Volta Government issued a tender for bids for the construction of the railroad, which was scheduled to begin in early 1976.

The Tambao railroad was also to serve a cement factory to be built at Tin Hrassan, situated 29 kilometers northwest of Tambao. The plant was to utilize limestone from a nearby quarry, where reserves were reported at 56 million tons of rock averaging 46% CaO and 3% MgO. In addition, the Société Voltaïque pour l'Avancement de l'Industrie, du Commerce et de l'Agriculture was to undertake as its first major project the construction of a cement plant processing imported clinker. Startup was to be in 1976 at an initial capacity of 30,000 tons of cement per year.

The new railroad was further expected to boost the joint development projects of the three-nation Liptako-Gourma Development Authority. This office was created in 1972 to promote the advancement of an underdeveloped area covering east-central Niger, western Mali, and northeastern Upper Volta. In 1975, the Authority received a loan of $500,000 from the ADB for the construction of a road connecting Dori in Upper Volta to the Niger capital of Niamey. The Authority also sought financing for the extension of the projected Tambao railway to Ansonga in Mali, with a branch to Niamey.

Several mineral research programs were conducted in previous years in Upper Volta, most notably by BRGM and the UNDP. Although significant mineral deposits were located and evaluated, exploitation of mineral resources has been inhibited by Upper Volta's lack of infrastructure and deteriorating economic situation. Among the most noteworthy deposits were copper reserves at Dienemara estimated at 40 million tons of ore containing 0.8% copper and 2 grams of gold per ton; a second manganese deposit at Kiéré estimated at 500,000 tons; titaniferous and vandiferous magnetite at Tin Edia with estimated reserves of 50 million tons of ore containing 40% to 45% Fe, 9% to 14% Ti, and 1% V_2O_5; and bauxite deposits in the Kaya-Kongoussi area believed to contain from 3 million to 5 million tons. Other mineralization of potential commercial value included marble deposits at Tiara, diamonds in the Camoe Basin, lead deposits at Gan, and antimony in the Mafoulu region.

Another possible development was the reopening of the Poura gold mine, situated 175 kilometers southwest of Ouagadougou. The mine was closed in 1966 after it was estimated that approximately 75% of the deposit was exhausted. However, Société de Recherches Minières (SOREMI) announced in 1975 that the mine could be operated for 4 additional years at a rate of 80,000 tons per year of ore. The rehabilitation of the Poura mine facilities was under consideration at yearend.

Mineral exploration was active in Upper Volta during 1975, and a number of new agreements were concluded during the year. An agreement was signed for the evaluation of phosphate mineralization in the southeastern Diapaga area with the French Aid and Cooperation Fund. The first phase of the study was estimated to cost $200,000. The reserves at Arly were previously reported to contain between 3 million and 4 million tons of ore grading between 27% and 31% P_2O_5. A second program for a general mineral survey of the southwestern part of the country was organized by the UNDP. The survey was to begin in 1976 for a period of 1 year, with costs set at $830,000. In addition, Upper Volta received aid from Canada in the amount of $20 million over a 5-year period, which was to finance, among other things, a geophysical survey of selected areas.

The Mineral Industry of the Islands of the Caribbean

By Nicholas G. Theofilos [1]

CONTENTS

BAHAMAS

Although the Bahamas are endowed with interesting geologic conditions, with a potential for petroleum, no exploration activity was undertaken during 1975. The only exploration interest in the island and its offshore potential was in connection with the proposed leasing of the Blake Plateau offshore towards the U.S. coast.

The Bahamas Oil Refining Co. (BORCO), whose refinery in Freeport has a capacity of 500,000 barrels of oil per day, was one of the largest employers in the Bahamas, as well as the largest single industrial enterprise. The refinery's crude petroleum was imported from Iran, Saudi Arabia, and Nigeria.

The Bahamian Government had been redrafting its petroleum law for 2 years, but at yearend 1975 it had not been completed.

The production of mineral commodities in the Bahamas is shown in table 1.

[1] Foreign minerals specialist, International Data and Analysis.

Table 1.—Islands of the Caribbean: Production of mineral commodities

Area, commodity, and unit of measure [1]	1973	1974	1975 p
ANTIGUA [2]			
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels--	495	e 765	NA
Jet fuel and kerosine ---do---	407	e 155	NA
Distillate fuel oil ---do---	773	e 634	NA
Residual fuel oil ---do---	2,450	e 1,500	NA
Other including refinery fuel and losses ---do---	717	--	NA
Total ---do---	4,842	e 3,054	NA
Sand and gravel ---thousand metric tons--	23	NA	NA
Stone, crushed ---thousand cubic meters--	45	NA	NA
BAHAMAS [2]			
Cement, hydraulic ---thousand metric tons--	953	794	381

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities—Continued

Area, commodity, and unit of measure [1]	1973	1974	1975 p
BAHAMAS [2]—Continued			
Petroleum refinery products:			
Kerosine ____ thousand 42-gallon barrels	--	300	--
Jet fuel ____ do	12,191	11,000	9,647
Distillate fuel oil ____ do	19,126	11,200	11,038
Residual fuel oil ____ do	53,582	45,500	44,645
Other ____ do	14,879	12,000	13,372
Refinery fuel and losses ____ do	4,563	2,000	744
Total ____ do	104,341	82,000	79,446
Salt ____ thousand metric tons	1,121	1,027	1,232
Stone:			
Aragonite ____ do	917	1,483	1,232
Limestone, for cement ____ do	1,269	989	521
BARBADOS [2]			
Gas, natural:			
Gross production e ____ million cubic feet	140	90	125
Marketed production ____ do	127	85	120
Petroleum:			
Crude ____ thousand 42-gallon barrels	10	48	123
Refinery products:			
Gasoline ____ do	333	297	305
Kerosine ____ do	77	62	68
Distillate fuel oil ____ do	402	382	461
Residual fuel oil ____ do	223	245	192
Other ____ do	28	24	30
Refinery fuel and losses ____ do	39	35	123
Total ____ do	1,102	1,045	1,179
CUBA [2] [3]			
Cement, hydraulic e ____ thousand metric tons	1,500	1,500	1,500
Chromite e ____ do	20	20	20
Cobalt e ____ metric tons	1,600	1,600	1,600
Copper, mine output, metal content e ____ do	r 2,100	r 2,900	3,000
Fertilizer, nitrogenous, manufactured [4] ____ thousand metric tons	2	20	5
Iron and steel, crude steel ____ do	221	240	260
Nickel:			
Mine output (content of oxide and sulfide) e ____ metric tons	r 36,500	r 33,900	36,600
Smelter e [5] ____ do	r 17,000	r 14,900	18,000
Petroleum:			
Crude ____ thousand 42-gallon barrels	918	e 930	e 1,000
Refinery products:			
Gasoline ____ do	7,744	e 7,905	NA
Kerosine ____ do	3,503	e 3,526	NA
Distillate fuel oil ____ do	6,445	e 6,700	NA
Residual fuel oil ____ do	r 18,248	17,982	NA
Lubricating oil ____ do	r 756	e 840	NA
Other:			
Liquefied petroleum gas ____ do	r 777	e 812	NA
Unspecified ____ do	938	e 962	NA
Total ____ do	r 38,411	38,727	NA
Sulfur, elemental e ____ thousand metric tons	20	20	20
DOMINICA			
Stone, sand and gravel:			
Gravel, crushed ____ do	--	5	23
Pumice and volcanic ash ____ do	113	18	106
Sand ____ do	--	1	2
DOMINICAN REPUBLIC [2]			
Aluminum, bauxite, dry equivalent, gross weight [6] ____ do	1,145	1,210	754
Cement, hydraulic ____ do	577	605	587
Copper, mine output, metal content ____ metric tons	450	450	--
Gold ____ thousand troy ounces	--	--	195
Gypsum [6] ____ thousand metric tons	229	e 200	147
Lime [6] ____ metric tons	NA	NA	2,150
Nickel:			
Mine output, metal content ____ do	30,100	30,500	26,900
Smelter (nickel content of ferronickel shipments) ____ do	30,100	31,200	30,000
Petroleum refinery products:			
Gasoline ____ thousand 42-gallon barrels	1,945	2,372	2,734
Kerosine and jet fuel ____ do	335	407	396
Distillate fuel oil ____ do	1,074	1,879	2,673
Residual fuel oil ____ do	1,443	1,629	2,444
Other, liquefied petroleum gas ____ do	356	467	545
Refinery fuel and losses ____ do	582	374	366
Total ____ do	5,735	7,128	9,158

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities—Continued

Area, commodity, and unit of measure [1]	1973	1974	1975 [p]
DOMINICAN REPUBLIC [2]—Continued			
Salt ---- metric tons	39,127	40,000	[6] 109,536
Stone, sand and gravel:			
Limestone ---- thousand metric tons	118	NA	148
Sand and gravel ---- metric tons	NA	NA	80
GUADELOUPE			
Abrasives, natural, pumice ---- thousand metric tons	NA	NA	200
Cement materials, pozzolana ---- do	160	175	NA
Clays ---- metric tons	1,000	NA	NA
Stone, sand and gravel: [6]			
Stone, crushed or broken ---- thousand metric tons	420	385	411
Limestone ---- do	975	975	702
Sand ---- do	238	255	165
HAITI [2 7]			
Aluminum, bauxite, dried, gross weight ---- do	648	659	522
Cement, hydraulic ---- do	108	142	150
Clays ---- do	NA	43	NA
Stone, sand and gravel:			
Limestone, crushed ---- do	73	172	[8] 191
Sand and gravel [e] ---- cubic meters	NA	NA	20,000
JAMAICA			
Aluminum:			
Bauxite, dry equivalent of crude ore, gross weight thousand metric tons	13,600	15,328	11,571
Alumina (exports) ---- do	2,416	2,805	2,375
Cement, hydraulic ---- do	403	405	407
Clays for cement [e] ---- do	140	140	140
Fertilizers, manufactured, mixed ---- do	NA	25	22
Gypsum ---- do	[r] 357	269	240
Lime ---- do	218	305	183
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	2,155	1,717	1,247
Kerosine ---- do	735	533	401
Jet fuel ---- do	527	763	587
Distillate fuel oil ---- do	1,981	1,770	2,136
Residual fuel oil ---- do	6,067	6,354	4,990
Other:			
Liquefied petroleum gas ---- do	279	311	234
Unspecified ---- do	150	189	310
Refinery fuel and losses ---- do	181	354	284
Total ---- do	12,075	11,991	10,189
Sand and gravel:			
Glass sand ---- thousand metric tons	28	27	33
Common sand and gravel ---- thousand cubic meters	NA	1,500	2,300
Stone:			
Limestone ---- thousand metric tons	[r e] 2,000	[e] 9,098	2,540
Marl ---- metric tons	NA	NA	7,620
MARTINIQUE			
Clays ---- thousand metric tons	30	[e] 23	[e] 27
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	951	1,713	1,920
Kerosine ---- do	164	160	([10])
Jet fuel ---- do	556	--	--
Distillate fuel oil ---- do	361	711	685
Residual fuel oil ---- do	1,321	1,218	940
Other, liquefied petroleum gas ---- do	176	175	178
Total ---- do	3,529	3,977	3,673
Pumice ---- thousand metric tons	151	[e] 110	[e] 130
Salt ---- do	158	[e] 160	[e] 160
Stone, sand and gravel:			
Stone, crushed and broken ---- do	932	[e] 292	[e] 311
Sand ---- do	19	[e] 198	[e] 255
MONTSERRAT			
Sand and gravel, natural ---- cubic meters	433,025	11,895	13,915
NETHERLANDS ANTILLES [2]			
Fertilizer materials:			
Phosphatic, crude phosphate rock ---- thousand metric tons	92	107	82
Nitrogenous, manufactured (sales) [e 4] ---- do	18	7	21
Petroleum refinery products:			
Gasoline:			
Aviation ---- thousand 42-gallon barrels	[r] 2,598	2,524	1,643
Motor ---- do	[r] 34,013	17,508	10,038

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities—Continued

Area, commodity, and unit of measure [1]	1973	1974	1975 p
NETHERLANDS ANTILLES [2]—Continued			
Petroleum refinery products—Continued			
Jet fuel thousand 42-gallon barrels	r 23,414	20,586	14,427
Kerosine do	r 2,976	1,420	794
Distillate fuel oil do	30,295	21,182	23,287
Residual fuel oil do	r 199,165	171,797	128,553
Lubricants do	r 4,212	3,743	2,373
Other do	r 11,267	26,484	27,267
Refinery fuel and losses do	9,154	16,354	12,846
Total do	r 317,094	281,598	221,228
Sulfur, elemental metric tons	r 81,000	116,000	87,000
Salt e thousand metric tons	480	480	480
ST. VINCENT			
Salt do	--	100	50
Sand and gravel do	--	610	12,700
Stone, crushed andesite do	--	1,830	5,690
TRINIDAD AND TOBAGO			
Asphalt, natural do	NA	77	73
Cement, hydraulic do	r 253	242	259
Clays:			
Argillite thousand cubic meters	155	148	198
Other do	NA	105	74
Fertilizer materials, manufactured, nitrogenous thousand metric tons	400	373	333
Gas, natural:			
Gross production million cubic feet	113,500	127,686	102,395
Marketed production do	r 64,353	58,240	e 55,000
Natural gas liquids thousand 42-gallon barrels	79	48	61
Petroleum:			
Crude do	60,666	68,131	78,613
Refinery products:			
Gasoline:			
Aviation do	231	421	189
Other do	19,600	18,651	13,958
Jet fuel do	8,353	8,407	3,870
Kerosine do	7,757	6,065	3,953
Distillate fuel oil do	15,347	14,885	10,827
Residual fuel oil do	81,820	74,485	48,377
Lubricants do	942	1,207	517
Other:			
Liquefied petroleum gas do	350	400	332
Asphalt do	--	76	151
Unspecified do	1,410	2,512	684
Refinery fuel and losses do	5,877	3,711	2,802
Total do	141,687	130,820	85,660
Sand and gravel:			
Pitch sand thousand cubic meters	26	37	33
Other sand and gravel do	109	281	312
Stone:			
Diorite do	--	1	(11)
Limestone do	337	12 391	12 425
Porcellanite do	NA	13	13
Sulfur, elemental, byproduct metric tons	42,120	26,206	15,551

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 material (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] Period covered is for year ending June 30 of that stated.

[5] Includes nickel content of nickel oxide and nickel fonte in addition to metallic nickel and ferronickel.

[6] Export figure, all production presumed to be exported.

[7] Presumably, salt is also produced but output is not reported and information is inadequate to make reliable estimates of output levels.

[8] Consumption figure.

[9] Figure reported in thousand cubic meters.

[10] Figure included in gasoline.

[11] Less than ½ unit.

[12] Figure reported in thousand metric tons.

Table 2.—Bahamas: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys, all forms	2	(1)
Copper metal including alloys, all forms	(1)	1
Iron and steel metal:		
Scrap	480	--
Semimanufactures	22	801
Lead including alloys, all forms	2	3
Other metals including alloys, all forms	4,422	4,273
NONMETALS		
Cement ... thousand tons	1,011	590
Fertilizers, manufactured	--	2
Salt ... thousand tons	r 750	975
Stone, sand and gravel:		
Dimension stone, worked ... value	$800	--
Sand	1	23
Other nonmetals, n.e.s	460	--
MINERAL FUELS AND RELATED MATERIALS		
Petroleum:		
Crude and partly refined ... thousand 42-gallon barrels	24,630	27,058
Refinery products:		
Gasoline:		
Motor ... do	12,046	11,784
Aviation ... do	7	106
Kerosine ... do	153	168
Jet fuel ... do	7,276	4,566
Distillate fuel oil ... do	10,541	7,549
Residual fuel oil ... do	51,047	49,581
Lubricants ... do	(1)	(1)
Other, liquefied petroleum gas ... do	(1)	(1)

r Revised.
1 Less than ½ unit.

Table 3.—Bahamas: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys:		
Unwrought	15	22
Semimanufactures	251	257
Copper including alloys, all forms	27	129
Iron and steel:		
Ore and concentrate	28,033	11,431
Metal:		
Scrap	21,196	2,586
Pig iron	(1)	--
Steel, primary forms	23	(1)
Semimanufactures:		
Bars, rods, angles, shapes, sections	4,759	6,324
Universals, plates, sheets	r 1,266	1,125
Hoop and strip	8	13
Rails and accessories	138	4
Wire	51	66
Tubes, pipes, fittings	10,380	13,851
Castings and forgings, rough	2,608	788
Lead metal including alloys, all forms	6	5
Nickel metal including alloys, all forms	(1)	(1)
Platinum-group metals and silver troy ounces	--	3,952
Tin including alloys, all forms	1,556	2,028
Uranium and thorium ores	--	2
Zinc metal including alloys, all forms	8	(1)
Other nonferrous base metals including alloys, all forms	9	3
NONMETALS		
Abrasives, natural, n.e.s	37	(1)
Cement	135,684	87,354
Clays and clay products (including all refractory brick)	758	215
Fertilizer materials:		
Crude	1,090	990
Manufactured	3,352	3,270
Lime	363	330
Salt	13,372	33,162
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked thousand tons	249	112
Worked value	$77,157	$37,174
Gravel and crushed rock	20,713	35,880
Limestone	--	1
Sand thousand tons	176	226
Sulfur	(1)	--
Other crude nonmetals, n.e.s	1,679	1,863
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	316	537
Coal	16	4,119
Coke and briquets	5,986	263
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	r 104,423	110,238
Refinery products:		
Gasoline:		
Motor do	787	532
Aviation do	r 115	115
Kerosine including white spirit do	733	317
Jet fuel do	42	43
Distillate fuel oil do	840	1,083
Residual fuel oil do	r 3,735	7,440
Lubricants do	30	39
Other:		
Liquefied petroleum gas do	174	174
Mineral jelly and wax do	(1)	(1)
Pitch do	(1)	(1)
Bituminous mixtures, n.e.s value	$67,190	$54,673
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals do	$30,298	$38,493

r Revised.
1 Less than ½ unit.

BARBADOS

The gross domestic product (GDP) of Barbados (at market prices) rose from $592 million in 1974 to $700 million in 1975. The outputs of petroleum products, natural gas, chemicals, and electricity increased over those of 1974. Production of quarry products and other construction materials decreased substantially from 1974 output, owing to reduced activity in the construction sector.

General Crude Oil Co., the only producer in Barbados, more than doubled crude petroleum production in 1975 from that of 1974. Average output from the Woodbourne Field was about 338 barrels per day, compared with about 160 barrels per day in 1974. Five development wells were drilled during the year; all were producers. A local refinery owned by a Mobil Oil Corp. affiliate, with a capacity of 3,000 barrels per day, processed both domestic and imported crude oil.

The linkup between the national distribution grid and the natural gas supplies at Woodbourne was completed in October 1975, and Natural Gas Corp. took delivery of 244 million cubic feet of natural gas. It was estimated that natural gas found in association with crude oil at the Woodbourne and Lowthers Fields would satisfy local demands over the next 5 years.

Production of mineral commodities in Barbados is shown in table 1.

Table 4.—Barbados: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Alumina	--	1
Metal including alloys:		
Scrap	3	13
Unwrought and semimanufactures	20	14
Copper:		
Ore and concentrate	10	7
Metal including alloys:		
Scrap	90	89
Unwrought and semimanufactures	(1)	7
Iron and steel:		
Ore and concentrate	--	1
Metal:		
Scrap	10	3,558
Pig iron, ferroalloys, similar materials	--	610
Steel, primary forms	(1)	--
Semimanufactures	579	459
Lead:		
Ore and concentrate	6	11
Oxides	17	--
Metal including alloys:		
Scrap	68	211
Unwrought and semimanufactures	46	1
Platinum-group metals, other ores	50	2,035
Tin waste and scrap	--	3
Zinc metal including alloys, unwrought and semimanufactures	(1)	(1)
Other:		
Ore and concentrate of base metals, n.e.s	21	5
Nonferrous metal scrap, n.e.s	247	15
Oxides, hydroxides, and peroxides of metals, n.e.s	2	--
NONMETALS		
Cement	111	7
Clays and clay products (including refractory brick):		
Crude clays, n.e.s	46	107
Products:		
Refractory (including nonclay brick)	20	92
Nonrefractory [2]	413	211
Diatomite and other infusorial earth	(1)	2
Fertilizer materials:		
Manufactured	7	(1)
Ammonia	1	(1)
Gypsum and plasters	1	1
Lime	7,562	30
Mica, worked including agglomerated splittings	1	--

See footnotes at end of table.

Table 4.—Barbados: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Salt	r 56	29
Sodium and potassium compounds, n.e.s	24	5
Stone, sand and gravel:		
Dimension stone:		
Crude	1	3
Worked	3	22
Gravel and crushed stone	8,900	457
Sand, excluding metal bearing	142	61
Sulfuric acid	1	1
Other crude nonmetals, n.e.s	4,083	(1)
MINERAL FUELS AND RELATED MATERIALS		
Coal, all grades, excluding briquets	4	3
Hydrogen, helium, rare gases	--	1
Peat including peat briquets and litter	1	--
Petroleum refinery products:		
Gasoline ......thousand 42-gallon barrels	9	11
Kerosine ......do	39	44
Jet fuel ......do	533	537
Distillate fuel oil ......do	238	653
Residual fuel oil ......do	258	834
Lubricants ......do	1	2
Other ......do	3	1
Total ......do	1,081	2,082

r Revised.
1 Less than ½ unit.
2 Partial figures, excludes quantities valued at $1,849 in 1973 and $12,477 in 1974.

Table 5.—Barbados: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Oxide and hydroxide	1	(1)
Metal including alloys, unwrought and semimanufactures	498	591
Copper metal including alloys, unwrought and semimanufactures	85	29
Iron and steel metal:		
Scrap	117	64
Pig iron, ferroalloys and similar materials	148	113
Steel, primary forms	27	4
Semimanufactures	14,895	2 18,887
Lead:		
Oxides	120	--
Metal including alloys:		
Scrap	5	(1)
Unwrought and semimanufactures	r 58	216
Nickel metal including alloys, unwrought and semimanufactures	1	2
Platinum-group metals:		
Other ores	7	137
Metals including alloys ......troy ounces	276	--
Silver metal including alloys ......do	403	8,410
Tin metal including alloys, unwrought and semimanufactures	172	811
Titanium oxides	r 94	--
Zinc:		
Oxide	r 5	--
Metal including alloys, unwrought and semimanufactures	46	34
Other:		
Scrap, nonferrous metals, n.e.s	4	(1)
Oxides, hydroxides, peroxides of metals, n.e.s	101	95
Base metals including alloys, all forms, n.e.s	1	3
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	1	3
Grinding and polishing wheels and stones	2	3
Asbestos	5	11
Cement	49,648	42,882
Chalk	1	30

See footnotes at end of table.

Table 5.—Barbados: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	20	143
Products:		
Refractory (including nonclay bricks)	[3] 77	280
Nonrefractory	[4] 722	[5] 76
Diatomite and other infusorial earth	r 34	39
Fertilizer materials:		
Manufactured:		
Nitrogenous	2,454	3,726
Phosphatic	10	--
Potassic	81	711
Other including mixed	12,798	5,860
Ammonia	20	17
Graphite, natural	(1)	1
Gypsum and plasters	8	14
Lime	1,026	990
Mica, all forms	20	10
Pigments, mineral:		
Natural crude	1	--
Iron oxides, processed	2	--
Precious and semiprecious stones, except diamond, natural ....kilograms	607	--
Salt	r 1,974	1,827
Sodium and potassium compounds, n.e.s.:		
Caustic soda	163	94
Caustic potash, sodic, potassic peroxides	10	--
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	44	22
Worked	11	28
Gravel and crushed rock	200	181
Sand, excluding metal bearing	220	40
Sulfur:		
Sulfur dioxide	1	(1)
Sulfuric acid, oleum	93	131
Talc, steatite, soapstone, pyrophyllite	5	17
Other nonmetals, n.e.s.:		
Crude	91	8
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	777	490
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	45	14
Coal, all grades, including briquets	96	104
Coke and semicoke	25	20
Hydrogen, helium, rare gases	5	5
Peat including peat briquets and litter	56	13
Petroleum:		
Crude and partly refined ....thousand 42-gallon barrels	922	853
Refinery products:		
Gasoline ....do	177	176
Kerosine ....do	44	71
Jet fuel ....do	506	591
Distillate fuel oil ....do	221	255
Residual fuel oil ....do	331	335
Lubricants ....do	15	14
Other:		
Liquefied petroleum gas ....do	82	87
Other ....do	2	6
Total ....do	1,378	1,535
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	7	5

r Revised.
[1] Less than ½ unit.
[2] Partial figure. Excludes quantity valued at $1,031.
[3] Partial figure. Excludes quantity valued at $5,633.
[4] Partial figure. Excludes quantity valued at $92,092.
[5] Partial figure. Excludes quantity valued at $179,908.

BERMUDA

The principal mining activity in Bermuda was the production of small quantities of sand, dimension limestone, and crushed limestone. Construction activity, which had been in a steady decline for the past few years, appeared to have bottomed out. Production of crushed limestone was about 67,000 tons in 1975. The majority of this output was used as an aggregate in asphalt mixes, and the remainder in concrete construction.

CUBA

Estimates of Cuban mineral production for 1975 are shown in table 1. In 1974 (latest data available), industrial output, measured in terms of constant 1965 prices, was almost one-third higher than in 1970. Nickel production was one of the most important items of the industrial sector. Production increased significantly with the opening of a new plant in the 1960's and then stabilized at around 35,000 to 37,000 tons per year. In 1975 nickel production accounted for about 14% of the value of Cuban exports.

Construction of two new 30,000-ton-per-year nickel plants was planned after Cuba was assured technical and financial assistance from the U.S.S.R. and other centrally planned economy countries. At the Nicaro and Moa Bay nickel plants, where most of Cuba's nickel was produced, modern equipment was installed to replace older machinery which was becoming obsolete. The Nicaro mine produced almost one-half of the country's nickel in the form of nickel oxide and sinter, with a metal content of about 90%. The remaining production came from the Moa Bay plant in the form of a concentrate containing slightly more than 60% nickel.

Alcan Canada Products, a subsidiary of Alcan Aluminium Ltd., contracted with Cuban aluminum producers to assist in the expansion of an aluminum plant near Havana.

Production of construction materials tripled over the last 5 years, and the present capacity of the cement industry was estimated at 2.4 million tons per year. Another cement plant with a capacity of 1.5 million tons per year was scheduled to go onstream in 1975.

Table 6.—Cuba: Selected mineral commodity imports from U.S.S.R.[1]

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys, all forms	5,700	6,792
Copper metal including alloys, all forms	5,681	5,745
Iron and steel:		
Scrap	56,517	59,426
Pig iron	107,535	100,200
Ferroalloys	3,385	3,300
Steel semimanufactures	230,800	245,100
Lead metal including alloys, all forms	1,200	1,202
Zinc metal including alloys, all forms	501	500
NONMETALS		
Abrasives, hard alloys	(2)	1
Asbestos	11,980	13,976
Cement, hydraulic	47,000	74,000
Fertilizer materials:		
Nitrogenous:		
Urea	60,140	58,757
Other, manufactured	255,500	256,400
Phosphatic	139,136	151,600
Potassic	127,019	126,700
Refractory materials	r 23,139	25,178
Sodium compounds, n.e.s.:		
Caustic soda	23,599	28,728
Soda ash	10,061	10,167
Sulfur	143,573	146,804
MINERAL FUELS AND RELATED MATERIALS		
Carbon black	4,060	4,079
Coal:		
Anthracite ____thousand tons	44	50
Bituminous ____do	18	26
Coke ____do	54	51
Petroleum, crude oil and refinery products ____do	7,435	7,643

r Revised.
[1] Soviet exports to Cuba reported in Vneshnyaya Torgoviya S.S.S.R. za 1974 god (Foreign Trade of the U.S.S.R. for 1974). Moscow, 1975.
[2] Less than ½ unit.

DOMINICAN REPUBLIC

The real rate of growth of the gross national product (GNP) of the Dominican Republic was about 5.5% in 1975, significantly below the 8.9% rate which was registered in 1974. This was mainly attributed to drought and electric power shortages combined with the inflated price of petroleum and other imports. The mining industry, however, has been playing an increasingly important role in the economy of the country for the last few years, with the value of mineral production increasing 26.5% in 1975.

During the year, two mining ventures of world status were in operation. The first, a nickel project, was the fourth largest producer in the market economy countries. It was operated by Falconbridge Dominicana C. por A. (Falcondo), a subsidiary of Falconbridge Nickel Mines of Canada. Falcondo's ferronickel was purchased and marketed by Falconbridge International Ltd., which exported ferronickel ingots to Europe, the United States, and Japan. About 2.1 million tons of ore was mined in 1975; ore reserves at yearend 1975 were about 57.8 million tons grading 1.58% nickel.

The second mining venture of world status was the Pueblo Viejo open pit gold-silver mine, which became one of the largest gold mines in the Western Hemisphere. The mine, located in Sanchez Ramirez Province in the north-central region of the country, was operated by Rosario Dominicana, S.A., a joint venture of private U.S. investors and the Dominican Republic. Total investment in the complex was $45 million, with a 40% interest held by Rosario Resources Corp., 40% by Simplot Industries, and 20% by the Dominican Republic Central Bank.

Startup problems were resolved during the year, and design capacity of 7,260 tons per day was reached in October 1975 along with anticipated metal recoveries. In 1975, the mill treated 1,542,566 tons of ore grading 0.130 troy ounce of gold and

0.148 troy ounce of silver per ton and produced 307,142 troy ounces of doré bullion containing 195,488 troy ounces of gold and 109,463 troy ounces of silver. Reserves of oxide ore at yearend 1975 were 26.5 million tons averaging 0.139 troy ounce of gold and 0.749 troy ounce of silver per ton. The underlying sulfide reserves were estimated at 21.1 million tons grading 0.115 troy ounce of gold and 0.839 troy ounce of silver per ton, 1.40% zinc, and 0.14% copper. Since conventional methods of processing these sulfide reserves were not economic, an active sulfide ore research program was started during the year to supplement previous work.

Work was in progress to restore and improve the area of the Pueblo Viejo mine. Tailings from the cyanide milling operation were being retained behind the new 1-kilometer-long tailings dam, which cost nearly $5 million for the first phase which raised the dam to a height of 140 meters. Total cost was expected to be nearly $10 million when the dam is completed to a height of 166 meters.

In accordance with the provisions of the Mining Law, Rosario Dominicana applied to convert its Los Cacaos exploration concession, adjacent to the Pueblo Viejo mine, on which Rosario discovered a lower grade gold-silver ore body, to a mining concession. This application was held up owing to a difference of opinion between the Government and the company regarding the manner in which the concession was to be exploited. The authorities proposed that a new 8,000-ton-per-day mill should be installed, but the company maintained that the deposit should be developed by an enlargement of the Pueblo Viejo mill by a 4,000-ton-per-day expansion program.

During 1975, the Aluminum Company of America (Alcoa) shipped 753,601 tons of bauxite to its processing facilities at Point Comfort, Texas, from its Cabo Rojo mine in the Dominican Republic. The comparable tonnage for 1974 was 1,209,548 tons. Some 54 out of the 300 employees that were employed at the beginning of 1975 were not with the company at yearend, owing to attrition and layoffs. In November 1975, Alcoa signed a new contract with the Dominican Republic increasing the return to the Dominican Government for each ton of bauxite exported by about 50%. The contract was to expire in December 1976.

As of yearend 1975, there was no production of crude petroleum in the Dominican Republic. Four companies were negotiating with the Government for exploration concessions. The only refinery in the country was equally owned by Shell Oil Co. and the Government. The refinery had a capacity of 30,000 barrels per day. Almost all of the crude petroleum input was imported from Venezuela.

All local cement production was by a state-owned company. During 1975, about 500,000 tons of cement was produced. Approximately 150,000 tons was imported to fulfill the country's consumption demand. Two new cement plants were scheduled for completion in 1976, which would make the Dominican Republic a net exporter of cement.

Table 7.—Dominican Republic: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum, bauxite ore and concentrate, gross weight	1,415,849	1,473,588	All to United States.
Copper metal, scrap	519	462	Do.
Iron and steel, ferronickel	76,175	79,835	Sweden 10,705; Italy 5,066; West Germany 4,868.
Nickel metal, scrap	129	94	All to United States.
NONMETALS			
Clay products, refractory value, thousands	--	$53	Do.
Fertilizer materials, manufactured do	--	$288	Do.
Gypsum and plasters do	$648	$924	Do.
Stone, calcareous	--	32,090	Do.

[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 trading partner countries.

Table 8.—Dominican Republic: Apparent imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal, unwrought and semimanufactures	2,098	1,742
Copper metal, unwrought and semimanufactures	1,129	1,215
Iron and steel:		
Scrap	--	17,517
Pig iron and ferroalloys	1,231	1,008
Steel ingots and equivalent primary forms	7,885	4,144
Semimanufactures	68,044	104,806
Lead metal, unwrought and semimanufactures	176	166
Manganese ore and concentrate	--	490
Nickel metal, unwrought and semimanufactures ....value, thousands	--	$46
Tin metal, unwrought and semimanufactures	--	15
Zinc metal:		
Blue powder	--	100
Unwrought and semimanufactures	339	475
Other:		
Oxides, hydroxides, and peroxides of metals, n.e.s	--	316
Base metals, including alloys, all forms	--	3
NONMETALS		
Abrasives, natural, grinding and polishing wheels and stones value, thousands	$160	$151
Asbestos	693	1,380
Cement, hydraulic	19,907	79,376
Clays and clay products:		
Crude clays	855	811
Clay products:		
Nonrefractory	(2)	1,536
Refractory ....value, thousands	$1,432	$1,828
Fertilizer materials:		
Crude	--	2,478
Manufactured:		
Nitrogenous	125,532	94,093
Phosphatic	12,850	14,864
Potassic	36,905	35,399
Mixed	28,855	38,714
Gypsum and plasters	--	552
Magnesite ....value, thousands	$73	$65
Sodium and potassium compounds	--	9,534
Stone, sand and gravel:		
Dimension stone, worked	363	78
Gravel and crushed stone	491	1,265
Talc and steatite	--	661
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline ....thousand 42-gallon barrels	117	130
Jet fuel ....do	10	--
Distillate fuel oil ....do	--	281
Residual fuel oil ....do	2,042	837
Lubricants ....do	164	80
Other ....do	335	447
Total ....do	2,668	1,775

[1] Source: Petroleum data—U.S. Bureau of Mines. International Petroleum Annual, 1973 and 1974; all other figures—official trade returns of selected trading partner countries.
[2] Value only reported at $79,000.

HAITI

The only significant mining in Haiti in 1975 was for bauxite and was conducted by Reynolds Haitian Mines S.A., a subsidiary of Reynolds Metals Co. Following the partial recovery in bauxite prices in 1973, Reynolds increased its exports substantially. This was followed by higher taxation on the bauxite industry. Negotiations led to agreement between Reynolds and the Government on the 1975 tax rates. The company was to pay 8% of the price of aluminum ingots realized in the United States, plus a levy of 50 cents per ton. The 8% tax was to be reduced by any income or other taxes which may be payable. A severance levy of $2 million in 1975 also was to be paid by Reynolds.

Kennecott Copper Corp. and Peñarroya, a subsidiary of a French concern, were granted mineral prospecting rights by

Haiti. Each of the firms was awarded 100 square kilometers in northern Haiti where large copper deposits were reportedly found earlier in the year.

On March 25, 1975, the President of Haiti signed a decree establishing an independent agency to coordinate mineral activities. Specifically, the new agency was to be responsible for the exploration, conservation, development, and utilization of the country's resources.

Table 9.—Haiti: Exports and imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations or sources, 1974
	EXPORTS		
Aluminum, bauxite	790,457	809,883	All to United States.
Metals, unspecified	17	--	
	IMPORTS		
METALS			
Aluminum metal, all forms	368	381	Austria 240; United States 124.
Copper metal, all forms	12	22	United States 18.
Iron and steel:			
Ore and concentrate	--	43	United States 23; France 20.
Scrap	2	15	United States 6; Bahamas 5.
Semimanufactures [2]	19,229	18,612	France 4,099; Belgium-Luxembourg 3,179; United States 3,162.
Lead metal, all forms	1	1	Mainly from West Germany and United States.
Platinum-group metals ______troy ounces	32	96	All from United States.
Silver metal ______do	64	--	
Tin metal, all forms	392	459	United States 401.
Other:			
Ore and concentrate, n.e.s	--	3	Mainly from United States.
Base metals including alloys, all forms	--	30	Do.
NONMETALS			
Abrasives, natural, grinding and polishing wheels and stones	97	7	West Germany 4; United States 2.
Cement	854	1,390	Denmark 804; Belgium-Luxembourg 276.
Clays:			
Crude	98	79	Mexico 26; United States 24; France 19.
Manufactured products	569	703	United States 314; Italy 95; Spain 85.
Fertilizer materials:			
Crude:			
Phosphatic	2	16	United States 11; Canada 5.
Potassic	5	30	All from West Germany.
Manufactured, nitrogenous	120	600	United States 569.
Mica, worked and unworked, including splittings and waste	7	3	United States 2.
Pigments, mineral, natural	93	139	West Germany 49; United States 26.
Salt	85	304	United States 187; Jamaica 113.
Stone, sand and gravel:			
Sand and gravel, including crushed quartz	150	202	Netherlands 102; Belgium-Luxembourg 71.
Stone:			
Dimension, worked and partly worked	4	127	Italy 97; France 29.
Industrial, except dimension	34	43	West Germany 25; United States 18.
Limestone	8	6	All from United States.
Other:			
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	386	370	Belgium-Luxembourg 154; France 93; Italy 57.
Nonmetallic minerals, worked and unworked, n.e.s	r (3)	4	United States 3.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	124	683	United States 666.
Coal, coke, agglomerates	24	47	Belgium-Luxembourg 25; United States 19.

See footnotes at end of table.

Table 9.—Haiti: Exports and imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations or sources, 1974
IMPORTS—Continued			
MINERAL FUELS AND RELATED MATERIALS —Continued			
Petroleum refinery products:			
Gasoline ..thousand 42-gallon barrels..	80	100	Netherlands Antilles 77; Italy 21.
Kerosine ....do....	9	16	Netherlands Antilles 10.
Distillate fuel oil ....do....	428	675	Netherlands Antilles 493; Colombia 67; Italy 63.
Lubricants ....do....	13	r 13	Trinidad and Tobago 5; United States 4.
Other:			
Liquefied petroleum gas ....do....	12	31	Panama 17.
Mineral waxes ....do....	3	1	Mainly from West Germany and United Kingdom.
Bituminous mixtures, n.e.s .do....	(3)	(3)	Mainly from West Germany and United States.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	9	1	Mainly from United Kingdom.

r Revised.
[1] Data are for years ending September 30 of that stated.
[2] Includes small quantities of pig iron, ferroalloys, and crude steel.
[3] Less than ½ unit.

JAMAICA

The worldwide inflation, accompanied by a recession in the manufacturing industries of the Western World, had an adverse effect on the Jamaican bauxite and alumina industries. The United States and Canada, Jamaica's major outlets for its bauxite and alumina, reduced their demand significantly. Nevertheless, Jamaica remained the second largest bauxite-producing country in the world, after Australia. The loss of Government revenue from the declining bauxite and alumina exports was largely compensated for by the higher production taxes levied in 1974 and 1975.

Reynolds Jamaica Mines, Ltd., a subsidiary of Reynolds Metals, and the Government entered into a preliminary agreement concerning future operations by Reynolds in Jamaica. The agreement contemplated the sale by Reynolds to the Government of a 51% share in the mining assets, and all of Reynolds' land holdings in Jamaica, at book value, to be paid in 10 equal annual installments, with interest. A partnership between the Government and Reynolds was to continue the mining operations. The partnership was to be managed by Reynolds Jamaica Mines under an initial 7-year management contract, subject to policy direction by an executive committee composed of an equal number of representatives from the Jamaican Government and Reynolds. The agreement was reported to include reductions in Jamaican income taxes paid by Reynolds. This agreement was contingent on a commitment by Reynolds to construct a new alumina plant in Jamaica. This plant was to be part of the 600,000-ton-per-year alumina plant planned by the Governments of Jamaica and Mexico for the projected aluminum smelter in Mexico.

In August 1975, Revere Jamaica Alumina, Ltd. (RJA), a subsidiary of Revere Copper & Brass Inc., temporarily suspended its mining and alumina operations. Under Jamaican mining law, suspension of mining beycnd 6 months required the consent of the Minister of Mining. RJA had sought such consent but as of year-end had received no response. During the year, the Minister of Public Utilities and Transport announced the establishment of a national merchant shipping fleet to be known as Jamaica Merchant Marine, Ltd. The establishment of the fleet was based on an agreement with the national shipping line of Mexico. The national shipping line was to help strengthen and protect Jamaica's trade and reduce the loss in foreign exchange paid to transport the substantial volume of bauxite and alumina exports to extraregional destinations such as the U.S. gulf coast and eastern Atlantic ports. Long-range plans for the fleet included the transport of alumina from Jamaica to the Mexican smelter when it is established.

The Government announced plans for a new petroleum refinery to be built on the southwest coast (St. Elizabeth) between 1976 and 1978. The refinery was to have a capacity of 80,000 barrels per day and was to cost about $100 million. Mexico was expected to provide financial and technological aid. The Government was also negotiating terms for the purchase of Esso's 32,500-barrel-per-day refinery at Kingston. The Government expected that the state-owned complex would form the basis for new industrial developments in chemicals, fertilizers, and caustic soda.

Table 10.—Jamaica: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite and concentrate thousand tons	7,390	8,000	All to United States.
Alumina do	2,381	2,816	United States 956; Norway 631; United Kingdom 439.
Metal including alloys:			
Scrap	59,289	731	United States 533; Canada 112.
Unwrought and semimanufactures	1,004	844	Barbados 206; Trinidad and Tobago 176; Martinique 163.
Copper metal including alloys:			
Scrap	394,223	71	West Germany 51; United States 14.
Unwrought and semimanufactures	(1)	40	Mainly to United States.
Iron and steel metal:			
Scrap	147	678	Do.
Steel, primary forms	--	335	Trinidad and Tobago 243; Guyana 87.
Semimanufactures	[2] 571	[3] 1,828	United States 998; Trinidad and Tobago 296; Guyana 270.
Lead:			
Ore and concentrate value	$1,584	--	
Metal including alloys:			
Scrap	109	240	Puerto Rico 122; Belgium-Luxembourg 103.
Unwrought and semimanufactures	395	44	United States 26; Dominican Republic 18.
Magnesium metal and alloys, unwrought and semimanufactures	125	--	
Nickel metal and alloys, unwrought and semimanufactures	3	--	
Platinum-group metals and alloys, unwrought and semimanufactures value, thousands	$2	--	
Silver metal and alloys, unwrought and semimanufactures troy ounces	315	1,400	All to United States.
Tin metal including alloys:			
Scrap	32,353	1,160	Mainly to United States.
Unwrought and semimanufactures	19	--	
Zinc metal and alloys, unwrought and semimanufactures	14	--	
Other:			
Ash and residues containing nonferrous metals	--	82	All to United States.
Scrap of nonferrous metal, n.e.s	--	1,153	United States 46; United Kingdom 13.
Metals including alloys, unwrought and semimanufactures	138	90	Mainly to West Germany.
NONMETALS			
Abrasives	(1)	(1)	All to Cayman Islands.
Cement, hydraulic	2,968	619	Turks and Caicos Islands.
Chalk	84	--	
Clays and clay products:			
Crude	1	--	
Clay products:			
Nonrefractory	1	--	
Refractory	98	[4] 44	Mainly to Cayman Islands.
Fertilizer materials:			
Manufactured:			
Nitrogenous	47	46	All to Cayman Islands.
Phosphatic	81	--	

See footnotes at end of table.

Table 10.—Jamaica: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured—Continued			
Potassic	--	20	All to United States.
Mixed	165	224	Do.
Ammonia	11	(1)	All to Haiti.
Gypsum and plasters	327,351	219,449	Mainly to United States.
Lime	2,323	949	Mainly to Barbados.
Mica, crude and manufactured	155	49	United States 38; Guyana 7.
Pyrite (gross weight)	254	--	
Salt	198,226	234	Mainly to Haiti.
Stone, sand and gravel:			
Dimension stone, crude and worked	14	(1)	All to Cayman Islands.
Gravel and crushed stone	(1)	47	United States 38; France 9.
Limestone (except dimension)	3	--	
Sand, excluding metal bearing ..value	$133	--	
Sodium carbonate	3	(1)	All to Trinidad and Tobago.
Sulfur, sulfuric acid	(1)	150	Mainly to Dominican Republic.
Other nonmetals, n.e.s.:			
Crude	--	(1)	All to France.
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals, n.e.s	229	3,811	Mainly to Dominican Republic.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	55,080	1,535	Haiti 767; Cayman Islands 766.
Carbon, gas	3,050	--	
Coke and semicoke ..value	$13	$66	All to Cayman Islands.
Hydrogen, helium, rare gases	--	9	Haiti 5; Trinidad and Tobago 4.
Petroleum:			
Crude oil ..thousand 42-gallon barrels	177	(1)	All to Canada.
Refinery products:			
Gasoline ..do	379	4	Mainly to Cayman Islands.
Jet fuel and kerosine ..do	101	(1)	Do.
Distillate fuel oil ..do	27	249	Belize 150; Panama 77.
Residual fuel oil ..do	87	147	All to United States.
Lubricants ..do	152	154	Surinam 19; Dominican Republic 17; Guyana 17.
Other:			
Liquefied petroleum gas ..do	r 1	(1)	Mainly to Trinidad and Tobago.
Petroleum jelly and wax ..do	4	--	
Nonlubricating oils, n.e.s ..do	(1)	(1)	Cayman Islands and Haiti.
Asphalt ..do	5	9	Cayman Islands 3; Paraguay 1.
Bitumen ..do	r 1	4	All to Cayman Islands.
Total ..do	r 757	567	
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	(1)	1	All to Venezuela.

r Revised.
1 Less than ½ unit.
2 Partial figure; excludes exports valued at $1,403.
3 Partial figure; excludes exports valued at $443.
4 Partial figure; excludes exports valued at $611.

Table 11.—Jamaica: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Bauxite	--	(1)
Oxide and hydroxide	40	34
Metal and alloys, unwrought and semimanufactures	7,201	3,518
Copper metal and alloys, unwrought and semimanufactures	1,236	1,200
Gold metal, unworked or partly worked ... value, thousands	$64	$108
Iron and steel:		
Ore and concentrate	30	--
Metal:		
Scrap	r 42	12
Pig iron, ferroalloys, similar materials	478	723
Steel, primary forms	4,248	13,430
Semimanufactures	130,824	88,705
Lead metal and alloys, unwrought and semimanufactures	3,102	231
Magnesium metal and alloys, semimanufactures	1	(1)
Manganese ore and concentrate	92	44
Nickel metal and alloys, unwrought and semimanufactures	25	500
Platinum-group metals and silver:		
Ore and concentrate ... value	$26	$100
Waste and sweepings ... do	$470	$1,544
Metals including alloys:		
Platinum group ... do	$3,707	$27,479
Silver ... do	$700,634	$877,410
Tin metal and alloys, unwrought and semimanufactures	27,231	9,259
Tungsten metal and alloys, unwrought and semimanufactures	1	1
Uranium and thorium metals, including alloys, unwrought and semimanufactures	5	(1)
Zinc:		
Ore and concentrate	(1)	--
Metal including alloys:		
Blue powder	258	8
Unwrought and semimanufactures	418	701
Other:		
Scrap of nonferrous metals, not further described	5	2
Nonferrous metals, n.e.s, unwrought and semimanufactures	49	16
NONMETALS		
Abrasives, natural:		
Pumice, emery, natural corundum, etc	49,429	20
Dust and powder of precious and semiprecious stones ... value	--	$978
Grinding and polishing wheels and stones	95	53
Asbestos, crude, washed or ground	743	1,680
Barite, natural	1,468	26
Boron, crude natural	1	2
Cement, hydraulic	8,533	29,643
Chalk	186	21
Clays and clay products:		
Crude	886	744
Clay products:		
Nonrefractory	5,301	4,926
Refractory	[2] 68,098	[3] 241
Diamond:		
Gem, not set or strung ... value, thousands	$115	$105
Industrial ... do	$20	$1
Diatomite and other infusorial earth	46	223
Feldspar, fluorspar, cryolite, chiolite, nepheline syenite	108	105
Fertilizer materials:		
Crude:		
Nitrogenous	30	(4)
Phosphatic	930	379
Potassic	2,720	--
Manufactured:		
Nitrogenous	33,584	31,361
Phosphatic	14,635	9,370
Potassic	9,461	16,164
Mixed	1,663	10
Ammonia	126	88
Graphite, natural	1	1
Gypsum and plasters	8,118	517
Lime	11,332	85
Magnesite, crude	587	2
Mica:		
Crude	690,449	135
Worked	73	98
Pigments, natural crude	1,903	91
Precious and semiprecious stones ... value, thousands	$29	$66
Salt	339,447	22,755

See footnotes at end of table.

Table 11.—Jamaica: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Sodium compounds, n.e.s.:		
Sodium carbonate	2,731	4,406
Sodium hydroxide	519,600	454,243
Stone, sand and gravel:		
Dimension stone	r 9,102	495
Gravel and crushed stone	167	323
Limestone (except dimension)	r 5,810	2,177
Quartz, unground ____value	r $20	$3,045
Sand including ground quartz	391	167
Sulfur:		
Elemental	381	330
Sulfur dioxide	2	3
Sulfuric acid	2,620	53
Talc, steatite, soapstone, pyrophyllite	951	1,191
Other nonmetals, n.e.s.:		
Crude	11	11
Slag, dross and similar waste, not metal bearing	18,375	(1)
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	1,096	2,602
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	1,374	950
Carbon gas	29	1,374
Coal and briquets	77	114
Coke and semicoke	938	743
Hydrogen, helium, rare gases	5	20
Peat including briquets and litter ____value	$65	$211
Petroleum:		
Crude and partly refined ____thousand 42-gallon barrels	10,623	10,969
Refinery products:		
Gasoline ____do	1,038	508
Jet fuel and kerosine ____do	125	291
Distillate fuel oil ____do	2,165	1,147
Residual fuel oil ____do	1,191	5,944
Lubricants ____do	111	165
Other:		
Liquefied petroleum gas ____do	158	116
Petroleum jelly and wax ____do	7	13
Nonlubricating oils, n.e.s ____do	2	5
Asphalt, bitumen, pitch and pitch coke ____value, thousands	$66	$194
Petroleum coke ____thousand 42-gallon barrels	54	(1)
Total 5 ____do	r 4,851	8,189
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	113	475

r Revised.
1 Less than ½ unit.
2 Partial figure; excludes quantity valued at $27,668.
3 Partial figure; excludes quantity valued at $453,305.
4 Quantity not available but valued at $245.
5 Totals are partial figures, excluding quantities of asphalt, bitumen, pitch and pitch coke.

MARTINIQUE

The economy of Martinique experienced strong inflationary pressures in 1975, and relatively little progress was made in the small industrial sector. Export-import trade increased, and the GNP increased at current prices from $654 million in 1974 to $769 million in 1975.

The major minerals produced in Martinique were construction aggregates, clays, marine salt, fertilizers, cement, and petroleum refinery products. Martinique's only refinery, S.A. Raffinerie Antilles, at Fort de France, had a capacity of 11,000 barrels per day. Principal refinery products were gasoline and residual and distillate fuel oil. Almost 40% of the refined petroleum products were exported.

The economy of Guadeloupe also experienced strong inflationary pressures in 1975. Mineral production was limited to construction aggregates and cement.

NETHERLANDS ANTILLES

Petroleum refining continued to be the most important industry in the Netherlands Antilles during 1975. Shell Curaçao, N.V., accounted for 40% of the GNP of Curaçao, one of the six islands in the Netherlands Antilles. Its refinery, covering more than 1,000 acres, employed about 3,000 workers. About 50% of the crude came from Venezuela, and the remainder came from the Mideast and Nigeria.

At the Aruba refinery of Lago Oil and Transport Co., a subsidiary of Standard Oil Co. (New Jersey), energy conservation became the highest priority in the last few years when the price of imported crude oil increased. Thus, strict control of process furnaces and boilers slashed fuel cost by $2.5 million in 1975.

Because of the shortages of cement, which the construction industry faced, along with the increase in the price of cement, a group of Netherlands Antilles investors formed Aruba Cement Co. and initiated plans for the construction of a cement plant in Aruba. Projected production was to be about 100,000 tons of cement per year, using local materials as much as possible. Construction of the facility was scheduled to begin in 1976.

The production of mineral commodities in the Netherlands Antilles is shown in table 1.

Table 12.—Netherlands Antilles: Foreign trade in petroleum and petroleum refinery products

(Thousand 42-gallon barrels)

Commodity	1973	1974
EXPORTS		
Petroleum refinery products:		
Gasoline, aviation	2,261	--
Gasoline, other	23,877	13,058
Jet fuel	25,360	20,011
Kerosine and white spirit	1,015	1,016
Distillate fuel oil	27,580	20,413
Residual fuel oil	186,653	149,129
Lubricants	3,668	3,571
Other	10,591	31,111
Total	281,005	238,309
IMPORTS		
Crude oil	327,161	296,036
Petroleum refinery products:		
Jet fuel and kerosine	307	--
Distillate fuel oil	450	217
Lubricants	60	68
Other	3,512	1,132
Total	4,329	1,417

TRINIDAD AND TOBAGO

Trinidad and Tobago produced an average of 215,000 barrels of crude oil per day in 1975. Thus, oil was a significant factor in the country's large balance-of-payments surplus, and a major contributor to the country's strong economy. The Trinidad and Tobago Government inaugurated an 8-year development program, the object of which was to foster new basic industries and to fully utilize the higher oil revenues. The Government's policy of acquiring participation in the foreign-owned oil operations in Trinidad continued during 1975. The negotiations were rescheduled to begin in January 1976.

Most of Trinidad's production came from offshore fields. Recent increases in offshore production more than offset the long-term decline in onshore production. Of the total crude oil produced in Trinidad and Tobago in 1975, approximately 81% came from offshore. A large part of this crude was exported, but some was refined at the island's two major refineries. The refineries, with a combined capacity of 465,000 barrels per day, also imported a substantial quantity of crude oil from other countries for processing and subsequent reexporting as refined products, mostly to the United States. The major suppliers of the crude were Saudi Arabia and Indonesia.

Amoco Trinidad Oil Co. Ltd., a subsidiary of Standard Oil Co. of Indiana, produced and exported about 135,000 barrels per day of high-quality, low-sulfur crude. The crude was piped through a 16-inch underwater line to the Galeota Point base, where it was stored in 500,000-barrel tanks prior to shipment to Amoco's refinery in the United States.

Trinidad and Tobago Oil Co., Ltd. (TRINTOC), formed in 1974 to operate the Shell properties purchased by the Government, refined all of its crude production. The refinery's main products were bunker C fuel oil, motor gasoline, diesel fuel, and aviation fuel.

The Texaco refinery closed down for 52 days during March and April 1975 owing to a strike by the Oilfield Workers Trade Union (OWTU) during negotiations for renewal of OWTU's 3-year contract which had expired in February. Many manufacturing concerns were forced to reduce production and to lay off workers owing to the lack of fuel. As a result, on April 9 the Government took control of existing stocks of petroleum products and ordered military and police personnel to make deliveries of these products to the general public.

In mid-August the Government formally constituted the National Gas Co. of Trinidad and Tobago as a wholly-owned Government operation. The company was to own the natural gas pipeline network, which was being expanded. Upon completion, the pipeline network was to receive gas from 20 miles offshore and distribute it to industrial users.

Amoco's discovery of a substantial natural gasfield about 45 miles offshore Trinidad increased Trinidad's proven natural gas reserves to around 6 trillion cubic feet.

Deminex, a West German oil company, began exploratory drilling operations from a semisubmersible platform about 20 miles off the northern coast of Trinidad. Seismic surveys made the company optimistic that hydrocarbons were present. The company expected natural gas rather than oil in commercially exploitable quantities.

Texaco also conducted exploratory drilling in a concession known as the "L-shaped block" southeast of Trinidad. This area was adjacent to Amoco's offshore crude oil production area and presently untapped natural gasfield.

Plans for a trination (Guyana, Jamaica, and Trinidad and Tobago) joint-venture aluminum smelter, to be built in Trinidad, utilizing local natural gas to produce power to smelt alumina from Guyana and Jamaica, received a sharp setback towards yearend 1975. At that time Jamaica and Guyana, which were to supply the smelter with alumina, announced that they would be unable to proceed with the project because of the need to divert alumina to Venezuela and Mexico, where large-scale aluminum production was projected. The Trinidad smelter was to have been designed to produce 200,000 tons of aluminum per year.

It was proposed that the Iron and Steel Co. of Trinidad and Tobago be formed as a joint venture among the Trinidad and Tobago Government with a 67% interest, ESTEL NV Hoesch-Hoogovens of West Germany 16.5%, Kawasaki Steel of Japan 11.5%, and Mitsui & Co., Ltd., of Japan 5%. A basic agreement was signed by the participants to construct a steel mill at Point Lisas, the site previously chosen for an aluminum smelter. Plans called for a natural-gas-fired direct-reduction plant with a designed capacity of 1.2 million tons of steel per year. Production was to start by yearend 1978.

Plans for a $250 million petrochemical complex to utilize local crude oil and refinery products were announced in 1975. Technical assistance was to be sought from Austria and Romania.

The production of mineral commodities in Trinidad and Tobago is shown in table 1.

Table 13.—Trinidad and Tobago: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys, all forms	r 30	73
Copper metal including alloys, all forms	r 521	551
Iron and steel:		
Scrap	8,047	13,879
Steel, primary forms	220	45
Semimanufactures	r 606	2,225
Lead:		
Ore	r 141	93
Metal including alloys, all forms	r 40	779
Platinum, waste and sweeping ....troy ounces	--	920
Silver metal including alloys ....do	5,930	6,768
Zinc metal including alloys, all forms	(1)	15
Other metals including alloys, all forms	r 183	(1)
NONMETALS		
Cement, hydraulic ....value, thousands	r $2,371	$2,139
Clays and clay products including refractory brick	r 578	2 628
Fertilizer materials, manufactured:		
Nitrogenous	r 121,693	135,022
Other including mixed	r 34,055	48
Lime	380	1,995
Precious stones, cut ....carats	(1)	--
Salt	68	211
Sodium and potassium compounds	30	40
Stone, sand and gravel:		
Dimension stone:		
Crude	22	--
Worked	r 5	(1)
Gravel and crushed stone	34	31
Sand	164	21
Sulfur:		
Elemental, all forms	14,127	--
Sulfuric acid including oleum	375	8,893
Other nonmetals, n.e.s.:		
Crude	23	--
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals n.e.s	495	8
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	47,784	44,821
Coal, coke and peat	2	1
Petroleum:		
Crude and partly refined ....thousand 42-gallon barrels	23,615	47,474
Refinery products:		
Gasoline ....do	17,898	17,413
Jet fuel ....do	7,535	7,488
Kerosine ....do	8,408	6,578
Distillate fuel oil ....do	12,774	12,804
Residual fuel oil ....do	72,954	63,500
Lubricants ....do	858	1,202
Other ....do	1,407	1,605
Total ....do	121,834	110,590
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 147,046	171,308

r Revised.
[1] Less than ½ unit.
[2] Partial figure, excludes quantity valued at $5,786.

Table 14.—Trinidad and Tobago: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys, all forms	r 1,161	737
Arsenic and compounds	173	(1)
Copper:		
Copper sulfate	6	27
Metal including alloys, all forms	r 470	780
Iron and steel:		
Scrap	r 861	127
Pig iron, ferroalloys, and similar materials	37	10
Steel, primary forms	2,127	4,436
Semimanufactures:		
Bars, rods, angles, shapes, sections	r 22,338	31,824
Universals, plates, sheets	64,426	37,861
Hoop and strip	2,773	303
Rails and accessories	2	6
Wire	4,723	4,264
Tubes, pipes, fittings	54,824	785,759
Castings and forgings	5	6
Lead:		
Ore and concentrate	10	--
Metal including alloys, all forms	566	616
Nickel metal including alloys, all forms	12	19
Platinum-group metals and silver:		
Metal including alloys:		
Platinum group troy ounces	85	42
Silver do	249,327	114,191
Tin metal including alloys, all forms	r 38	28
Zinc metal including alloys, all forms	289	916
Other metals including alloys, all forms	25	10
NONMETALS		
Abrasives, natural, n.e.s	2	30
Aluminum sulfate	1,327	1,761
Asbestos	4	57
Barite and witherite	r 22,074	15,718
Cement	r 9,521	2,709
Clays and clay products including all refractory brick:		
Crude clay, n.e.s	1,583	1,753
Products	4,779	[2] 2,713
Diamond carats	--	2,120
Feldspar	1,079	982
Fertilizer materials:		
Crude	r 148	--
Manufactured:		
Nitrogenous	r 211	103
Phosphatic	r 1,415	1,119
Potassic	r 4,813	27,043
Other including mixed	783	1,065
Gypsum	--	12,618
Lime	164	412
Magnesite	(1)	8
Mica, all forms	59	614
Pigments, mineral	66	136
Precious and semiprecious stones, except diamond, natural and manufactured carats	r 69,205	153
Salt	r 24,832	16,061
Sodium and potassium compounds, n.e.s.:		
Sodium hydroxides	8,787	4,680
Potassium hydroxides, sodic and potassic peroxides	4,086	4,569
Stone, sand and gravel:		
Dimension stone:		
Crude	18,677	1
Worked	69	21
Gravel and crushed stone	1,332	1,211
Sand	55	89
Sulfur:		
Elemental	3,073	22
Sulfuric acid	3,584	1,668
Talc	--	567
Other nonmetals, n.e.s.:		
Crude	782	--
Building materials of asphalt, unfired nonmetals and fiber cement, n.e.s	543	333
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	7	30
Coal, coke and briquets [3]	106	162
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	r 106,602	107,502

See footnotes at end of table.

Table 14.—Trinidad and Tobago: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
MINERAL FUELS AND RELATED MATERIALS—Continued		
Petroleum—Continued		
Refinery products:		
Gasoline ---------- thousand 42-gallon barrels	r 239	28
Kerosine and jet fuel ---------- do	r 158	27
Distillate fuel oil ---------- do	r 40	76
Residual fuel oil ---------- do	131	563
Lubricants ---------- do	48	74
Liquefied petroleum gas ---------- do	r 321	20
Other ---------- do	5	124
Mineral jelly and wax ---------- do	6	1
Total ---------- do	r 948	913
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	76	49

r Revised.
[1] Less than ½ unit.
[2] Partial figure, excludes quantity valued at $195,455.
[3] Includes peat.

The Mineral Industry of Central American Countries

By Nicholas G. Theofilos [1]

CONTENTS

BELIZE

The mineral industry of Belize in 1975 was limited to the production of limestone, marl, sand, and gravel, all of which were primarily used on public work projects. Exploration for petroleum continued during the year. It included seismic surveys and exploratory drilling. Belize Chevron drilled one wildcat hole in northern offshore Belize. Ajax Chemical Limited, and Ariel International Ltd., the subsidiaries of a major international corporation, who have had an exploration permit since 1967, undertook seismic work in southern offshore Belize. Anschutz Overseas, Inc., drilled exploratory wells in the northern and southern parts of the country. All resulted in dry holes.

[1] Foreign minerals specialist, International Data and Analysis.

Table 1.—Central American Countries: Production of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
BELIZE			
Limestone e	245,000	246,000	263,000
Marl e	26,000	30,000	38,000
Sand and gravel e	393,000	383,000	334,000
COSTA RICA			
Cement	271,816	297,922	330,000
Clays:			
Kaolin	NA	225	227
Refractory ____cubic meters__	5,000	694,440	NA
Other ____do____	110,000	100,000	NA
Diatomite	30,000	31,400	e 32,000
Fertilizer materials, manufactured:			
Nitrogenous, gross weight	42,006	43,243	NA
Mixed and unspecified, gross weight	57,490	27,157	NA
Gold ____troy ounces__	r 15,500	18,000	e 18,000
Iron and steel, magnetite sand, gross weight	e 2,000	NA	NA
Lime	12,850	21,750	NA

See footnotes at end of table.

Table 1.—Central American Countries: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 [p]
COSTA RICA—Continued			
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	690	604	502
Kerosine ... do	180	133	168
Distillate fuel oil ... do	1,213	1,319	455
Residual fuel oil ... do	776	614	794
Pumice ... cubic meters	2,115	3,115	3,000
Salt, marine	13,000	13,605	15,711
Silver ... troy ounces	290	3,000	[e] 3,000
Stone, sand and gravel:			
Limestone and other calcareous material	[e] 408,000	384,321	NA
Marble ... cubic meters	1,099	5,900	NA
Marine shell ... do	5,000	13,000	NA
Quartzite ... do	NA	2,660	NA
Sand and gravel	181,528	([1])	([1])
Silica sands ... cubic meters	NA	15,000	NA
Other	632,500	1,060,000	950,000
EL SALVADOR			
Aluminum metal, semimanufactures	1,694	2,064	1,361
Cement	235,243	291,400	331,823
Fertilizers, manufactured	82,033	100,052	98,547
Gold, fine ... troy ounces	5,233	6,022	8,713
Gypsum [e]	6,000	6,000	6,000
Iron and steel, steel semimanufactures	27,764	20,112	25,049
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	919	875	980
Kerosine ... do	384	248	NA
Jet fuel ... do	--	101	354
Distillate fuel oil ... do	1,141	1,207	1,489
Residual fuel oil ... do	1,378	1,610	1,459
Other:			
Liquefied petroleum gas ... do	213	185	215
Asphalt ... do	125	134	154
Refinery fuel and losses ... do	236	65	228
Total ... do	4,396	4,425	4,879
Salt	35,131	26,013	[e] 25,000
Silver, fine ... troy ounces	122,677	167,900	176,496
Stone, limestone, seashell	[e] 350,000	[r e] 400,000	503,621
GUATEMALA			
Antimony, mine output, metal content	[r] 873	436	856
Cadmium (contained in zinc concentrates) ... kilograms	[r] 63	NA	NA
Cement ... thousand tons	310	310	102
Clays:			
Bentonite ... cubic meters	NA	2,402	NA
Kaolin ... do	NA	220	NA
Other ... do	NA	28,068	NA
Copper, content of concentrates	--	1,641	2,560
Feldspar	2,000	30,000	NA
Gypsum	[e] 8,000	[e] 12,500	12,319
Iron ores, gross weight	--	[e] 4,536	6,000
Lead:			
Mine output, metal content	102	[r e] 100	[e] 100
Metal including secondary	65	227	225
Lime	[e] 23,000	56,233	34,631
Mica	[r e] 1,190	--	--
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	1,781	1,771	1,398
Kerosine and jet fuel ... do	759	658	536
Distillate fuel oil ... do	2,007	2,069	1,595
Residual fuel oil ... do	2,074	2,063	1,875
Other:			
Liquefied petroleum gas ... do	111	101	76
Unspecified ... do	2	3	1
Refinery fuel and losses ... do	261	154	NA
Total ... do	6,995	6,819	5,481
Salt	NA	8,884	8,800
Stone, sand and gravel:			
Crushed and broken:			
Limestone ... thousand tons	[e] 600	400	848
Volcanic ash [e] ... do	55	32	15
Marble ... cubic meters	650	1,200	1,200
Quartz	[e] 18,000	14,400	NA
Sand and gravel ... cubic meters	379,801	418,000	792,041
Talc	NA	11	NA
Tungsten concentrate (W content)	[r] 54	6	1
Zinc, mine output, metal content (exports)	280	--	--

See footnotes at end of table.

Table 1.—Central American Countries: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	1975 p
HONDURAS			
Antimony, mine output, metal content	48	135	103
Cadmium, mine output, metal content	247	217	230
Cement	235,309	214,747	271,023
Copper, mine output, metal content	NA	186	NA
Gold ---troy ounces	795	2,124	2,520
Gypsum	13,979	8,509	1,050
Lead, mine output, metal content	18,544	18,784	23,263
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels	727	704	716
Jet fuel ---do	71	71	86
Kerosine ---do	250	245	245
Distillate fuel oil ---do	1,248	1,217	1,223
Residual fuel oil ---do	1,875	1,788	1,949
Liquefied petroleum gas ---do	102	86	912
Refinery fuel and losses ---do	235	236	1,612
Total ---do	4,508	4,347	6,743
Salt	e 32,000	e 32,000	30,797
Silver ---thousand troy ounces	3,152	3,661	3,802
Stone, crushed and broken	350,000	315,465	NA
Zinc ore and concentrate, metal content	19,669	23,960	30,298
NICARAGUA			
Cement	192,195	235,732	193,488
Copper, mine output, metal content	1,401	1,775	508
Gold, mine output, metal content ---troy ounces	85,051	82,639	70,281
Gypsum and anhydrite, crude e	35,000	35,000	35,000
Lead ore and concentrate, metal content	1,396	1,752	309
Lime e	91,000	r 39,000	46,000
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels	1,198	1,166	1,197
Kerosine and jet fuel ---do	290	237	295
Distillate fuel oil ---do	1,065	1,153	1,150
Residual fuel oil ---do	1,137	1,328	1,608
Other:			
Liquefied petroleum gas ---do	160	161	155
Asphalt ---do	--	134	185
Unspecified ---do	57	64	52
Refinery fuel and losses ---do	247	87	253
Total ---do	4,154	4,330	4,895
Salt, marine e	10,000	10,000	12,000
Silver, mine output ---troy ounces	180,157	269,787	324,184
Stone, crushed and broken	NA	e 400,000	NA
Zinc ore and concentrate, metal content	r 11,148	8,837	6,327
PANAMA			
Cement	364,573	395,020	276,875
Clays and clay products:			
Crude clays, n.e.s	237,218	229,895	189,382
Products	93,073	110,000	60,000
Gold, fine ---troy ounces	NA	11	NA
Petroleum refinery products: [3]			
Gasoline ---thousand 42-gallon barrels	3,153	2,858	2,915
Kerosine and jet fuel ---do	3,037	3,078	2,614
Distillate fuel oil ---do	5,548	4,424	4,787
Residual fuel oil ---do	15,534	14,042	15,666
Other:			
Liquefied petroleum gas ---do	321	339	398
Asphalt ---do	88	93	
Unspecified ---do	467	571	1,100
Refinery fuel and losses ---do	1,052	617	1,320
Total ---do	29,200	26,022	28,800
Salt, marine	20,455	22,704	29,243
Stone, sand and gravel:			
Limestone	[2] 355,830	527,032	[2] 20,589
Other ---thousand cubic meters	2,007	e 3,034	1,729

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

[1] Production reported in cubic meters was as follows: 1974—210,000 and 1975—215,000.

[2] Excludes an amount reported in volumetric units of 8,000 cubic meters.

[3] Previously reported figures of refinery output for 1973 were actually 1974 data.

COSTA RICA

During 1975 economic activity in Costa Rica was maintained at a high level, led by the construction industry, with cement production increasing 11% for the second consecutive year.

The Government of Costa Rica was interested in a number of petroleum related projects. The Costa Rica Development Corp. (CODESA), in conjunction with Elf-Petroleos, a French concern, began drilling an offshore oil well just north of Port Limon. Also, the Government authorized the construction of a 93-mile, 48-inch cross-Isthmus pipeline to carry Alaskan and other crude oil from the Pacific to the Atlantic for ultimate shipment to the U.S. east coast. The pipeline was to have a capacity of 1.6 million barrels per day and was to be constructed by a consortium of Italian companies.

During 1975, Venezuela announced conceptual plans for a big refinery to be built in Costa Rica.[2] The crude oil will be supplied by Venezuela on a preferential basis.

About the middle of the year, the World Bank approved a $41 million loan for a fifth hydroelectric project in Costa Rica. This project will help Costa Rica reduce its dependence on imported petroleum while enabling the country to better meet its demands for electricity.

The search for alternative sources of power was given considerable thought in 1975. The Instituto Costarricense de Electricidad prepared a preliminary study of the country's geothermal potential. The volcanic range in Guanacaste Province was found to be the most promising site.

Kaiser Engineers of California made a feasibility study for a 500,000-ton-per-year cement plant. The plant could be in operation in 1978 if there were no delays in construction.

Towards yearend 1975, the Aluminum Company of America (Alcoa), confirmed that it was still seriously considering erecting a primary aluminum smelter in Costa Rica. Alcoa wished to provide alumina for the smelter from its Philippine or Jamaican facilities. However, the Government's plan was for the establishment of an aluminum plant based on local bauxite deposits, which to date had been largely unexploited.

Bulora Corp. Ltd.'s operations at the El Libano gold mine continued to improve after several startup problems. Underground workings were expanded and the reserves were added to with a fair increase in grade. The milling plant had been running steadily at 100-tons-per-day capacity with only minor shutdowns.

Hearne De Costa Rica, a subsidiary of United Hearne Resources, controlled three former gold producers. At the most promising operation, in Santa Clara, the exploration phase of the work had advanced to the stage where it was necessary to start bulk sampling. Studies showed reserves of about 750,000 tons of ore grading 0.10 troy ounce of gold per ton.

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[2] World Petroleum Report, 1975, p. 156.

Table 2.—Costa Rica: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS [1]			
Aluminum metal including alloys, all forms	2,625	2,348	El Salvador 379; United States 308; France 287.
Copper:			
Copper sulfate	26	19	West Germany 7; United Kingdom 7.
Metal including alloys, all forms	862	1,764	Peru 899; Mexico 502.
Iron and steel metal:			
Pig iron, ferroalloys, similar materials	126	327	West Germany 298.
Steel, primary forms	23,461	27,521	United States 19,404; Venezuela 3,150.
Semimanufactures	65,072	103,959	Japan 43,744; Belgium-Luxembourg 13,600.
Lead metal including alloys, all forms	177	242	Nicaragua 51; West Germany 50; United States 42.
Nickel metal including alloys, all forms	6	12	Mexico 5; United States 3; United Kingdom 3.
Platinum-group metals including alloys, all forms ____troy ounces	7,813	10,963	United States 10,934.
Silver metal including alloys ____do	12,507	32,858	United States 32,182.
Tin metal including alloys, all forms	6	13	United States 12.
Zinc metal including alloys, all forms	r 2,110	2,371	United States 1,125; Mexico 572; Japan 306.
Other:			
Ore and concentrate of nonferrous base metals, n.e.s	641	552	NA.
Waste and scrap of nonferrous base metals	10	32	NA.
Metals:			
Pyrophoric alloys	106	6	Nicaragua 5.
Nonferrous base metals including alloys, all forms, n.e.s	14	12	United States 8; Canada 2.
NONMETALS			
Abrasives, natural, n.e.s	63	102	United States 25; West Germany 24; Belgium-Luxembourg 15.
Asbestos	1,181	1,897	Canada 1,687.
Boron materials, oxide and acid	49	23	United States 22.
Cement	13,767	9,024	Colombia 3,253; Nicaragua 1,995; Japan 1,579.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	1,668	1,821	United Kingdom 1,010; United States 755.
Products:			
Refractory (including nonclay bricks)	688	1,561	United States 1,095; Canada 307.
Nonrefractory	1,628	3,003	Nicaragua 2,464.
Diamond, industrial ____carats	130,000	125,000	Canada 45,000; United States 40,000; Austria 35,000.
Diatomite and other infusorial earth	327	433	Mexico 386; United States 44.
Feldspar, fluorspar and cryolite	367	785	Guatemala 372; United States 222; Mexico 191.
Fertilizer materials:			
Crude, phosphatic, potassic	14	82	NA.
Manufactured:			
Nitrogenous	87,539	47,680	Netherlands 14,826; Venezuela 12,360; United States 5,142.
Phosphatic	39,947	60,910	United States 46,582; West Germany 6,531.
Potassic	40,768	45,752	United States 30,897; West Germany 7,724; Canada 6,021.
Other including mixed	5,458	1,716	United States 1,677.
Graphite, natural	5	2	West Germany 1; United States 1.
Lime	14,449	892	Nicaragua 724; Mexico 98.
Mica, all forms	10	13	West Germany 11; United States 2.
Precious and semiprecious stones, including gem diamond ____kilograms	17	37	NA.
Salt and brine	20,764	9,400	Nicaragua 7,054; Honduras 1,479.
Sodium compounds, n.e.s.:			
Caustic soda	3,939	4,807	Nicaragua 4,545.
Soda ash	760	567	United States 236; Colombia 157; West Germany 119.

See footnotes at end of table.

Table 2.—Costa Rica: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	121	273	Nicaragua 110; Guatemala 88; Italy 74.
Worked	95	47	Italy 16; Guatemala 15; Nicaragua 15.
Industrial stone	55	52	Nicaragua 48; France 4.
Sand, gravel, crushed rock, n.e.s	292	148	United States 143.
Other	2	(2)	Mainly from United States and Belgium-Luxembourg.
Sulfur:			
Elemental, all forms	(2)	49	NA.
Sulfur dioxide	(2)	1	United States 1.
Sulfuric acid	369	451	El Salvador 389.
Talc, soapstone, pyrophyllite	617	681	Italy 397; United States 146; Republic of Korea 96.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	1,395	1,748	Colombia 802; Mexico 613; Venezuela 236.
Coal and coke including briquets	496	383	West Germany 156.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	3,440	2,948	All from Venezuela.
Refinery products:			
Gasoline do	423	435	Venezuela 208; Netherlands Antilles 72; Trinidad and Tobago 54.
Kerosine do	110	57	Panama 43; Netherlands Antilles 14.
Distillate fuel oil do	695	673	Venezuela 494; Netherlands Antilles 158.
Lubricants (including grease) do	109	95	United States 33; Trinidad and Tobago 20; Netherlands Antilles 19.
Other:			
Liquefied petroleum gas do	118	225	Panama 71; Nicaragua 22.
Naphtha do	(2)	(2)	All from United States.
Paraffin do	20	66	West Germany 32; United States 14.
Petrolatum do	3	8	United States 8.
Unspecified do	157	353	United States 349.
Total do	1,635	1,912	
Mineral tar and other coal-, petroleum- or gas-derived crude chemicals	1,959	1,480	United States 912; Netherlands Antilles 520.

r Revised. NA Not available.
1 Metal oxides and hydroxides excluded as they were reported inseparably from metal salts and other compounds.
2 Less than ½ unit.

EL SALVADOR

The real growth in the gross domestic product (GDP) of El Salvador in 1975 was about 3.5%, somewhat above of the Central American average. A major contributor to this growth was the continued high level of public investment, such as the hydroelectric project at Cerrón Grande, and extensive road construction. The Government also continued its efforts in the geothermal energy area. The Comisión Ejecutiva Hidroelectrica del Rio Lempe (CEL) signed a contract with a French firm for a study of the geothermal potential in two zones near the existing facility at Ahuachapán. Meanwhile, the Comisión Nacional de Petróleo continued its invitations for oil exploration.

Canadian Javelin Ltd. expanded its exploration and diamond drilling and planned to explore known mineralized veins around the existing Los Encuentos and San Cristóbal silver and gold mines.

Bruneau Mining Corp., a subsidiary of Rosario Resources Corp., initiated a 5,000-foot diamond drilling program at the El Dorado gold property. The objective of the drilling was to extend the known ore occurrences and to indicate sufficient ore to justify dewatering the mine. The mine was operated from 1948 to 1953 by Rosario during which time 297,843 tons of ore averaging 0.28 troy ounce gold and 1.58 troy ounces silver were produced. The remaining reserves were reported to be 48,320 tons of ore grading 0.31 troy ounce gold and 1.78 troy ounces silver per ton.

A coal-based direct reduction sponge iron plant was proposed in order to relieve the expanding steel industry from its dependence on the volatile and uncertain international scrap market. The proposed plant was near Acajutla where Acero, S.A., the largest steel company, was in process of building a 100,000-ton-per-year electric furnace continuous-billet casting plant.

GUATEMALA

In December 1975 Guatemala's Congress passed a petroleum law clarifying some of the provisions in the 1974 petroleum code. Among the revisions added was the requirement for a $1 million signature bonus for each new concession. The law called for a 51%–49% production revenue split in favor of the Government, with the Government's share including credit for the operator's tax liability. Contracts were to be for a maximum of 20 years (versus 30 years previously). Finally, concession blocks were limited to 400,000 hectares (988,400 acres) with 5-year exploration terms.

The proving of considerable reserves of crude oil in southeast Mexico, and recent apparent discoveries in the Alta Verapaz District of Guatemala near the Mexican border, increased Guatemala's hopes of attaining self-sufficiency in crude petroleum and perhaps of becoming an exporter by the end of the decade.[3] As of yearend 1975, the country fully depended on imports to meet its petroleum requirements.

Shenandoah Oil Corp., which had previously drilled in northeast Guatemala, drilled Rubelsanto No. 3 and No. 4 wells in this area. Tests of the Rubelsanto No. 4 well showed oil from a dolomite limestone interval. The interval tested was at depths from 7,011 feet to 7,049 feet. The well flowed at a rate of 9,348 barrels per day through 3-½-inch tubing with two ¾-inch chokes.

The Guatemala-California oil refinery, a subsidiary of Chevron Oil Co., closed down around the middle of the year. The output of the refinery was to be replaced by the importation of finished petroleum products. The only refinery in operation in Guatemala at yearend 1975 was owned by Texaco, Inc.; its capacity was about 14,000 barrels per day.

Construction of facilities for the nickel project of Exploraciones y Explotaciones Mineras Izabal, S.A. (Exmibal), a consortium of International Nickel Co. Inc., and The Hanna Mining Co., reached the halfway point in 1975. It was scheduled to start producing in 1977, at an annual rate of 28 million pounds of nickel contained in nickel matte.

Basic Resources International, S.A., a Luxembourg firm, was seeking a partner for joint venture development of a nickel concession, adjacent to the Exmibal concession. Three lateritic ore deposits were reported to contain over 63 million tons of ore grading 1.7% nickel. Through subsidiaries, Basic Resources also holds several other mineral concessions in Guatemala. Their Oxec copper mine northeast of Guatemala City was operating at the rate of 400 tons per day, while producing 40 tons per day of copper concentrate.

The Instituto Nacional de Electrificacion, (INDE) began a project to develop geothermal resources in the southeastern part of the country. Drilling of exploratory wells was scheduled for early 1976.

Industria Centroamericana de Vidrio, S.A. (CAVISA), Guatemala's only glass manufacturing company, was expanding glass production and installed a new plant to produce silica and feldspar.

[3] The Petroleum Economist. Self-Sufficiency for Guatemala. July 1975, pp. 263–264.

HONDURAS

The mineral industry of Honduras continued to experience increases in the production of cement, silver, gold, lead, and zinc. On December 8, 1975, the Government issued by decree a new law which was expected to have an adverse effect on the profits of mineral companies in Honduras. This law replaced the 2.5% export tax with a graduated royalty. The royalty ranges from 5% for the first $50,000 to 20% for $5,000,000 and above. The Government had not decided whether to apply the royalty on the net smelter return, or on the net value f.o.b. of the material. The production tax for gold and silver was also raised from 4% to 5%. The 2% production tax on lead, zinc, and cadmium was not changed.

Rosario's El Mochito mine recorded the best year in overall metal production in its history. The mine produced 346,352 tons of ore, and the mill processed 345,737 tons containing 7.82% lead and 8.69% zinc and 10.98 troy ounces of silver and 0.007 troy ounce of gold per ton. Reserves at yearend 1975 were reported to be 6,323,249 tons of ore with an average grade of 5.20 troy ounces of silver and 0.003 troy ounce of gold per ton; 4.78% lead, 8.07% zinc, and 0.27% copper. Production at El Mochito in 1975 is shown in the following tabulation:[4]

[4] Rosario Resources Corp. Annual Report 1975, p. 5.

	Silver (troy ounces)	Gold (troy ounces)	Lead (metric tons)	Zinc (metric tons)	Cadmium (pounds)
Lead concentrates	2,510,924	1,354	22,453	3,490	--
Zinc concentrates	848,294	690	2,041	24,321	508,000
Doré bullion	182,004	227	--	--	--
Total	3,541,222	2,271	24,494	27,811	508,000

Table 3.—Honduras: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Antimony ore and concentrate, gross weight[1]	NA	255	United States 175; Belgium 80.
Gold metal ---troy ounces	735	--	
Iron and steel metal including alloys, all forms:			
Scrap	3,369	9,722	Spain 7,396; Colombia 1,650.
Other	606	1,428	Guatemala 818; Nicaragua 366; Costa Rica 236.
Lead:			
Ore and concentrate, gross weight[2]	NA	35,655	Mainly to United States.
Metal including alloys, all forms	8	--	
Silver:			
Ore and concentrate, gross weight	NA	[3] 11	All to Belgium-Luxembourg.
Metal including alloys ---thousand troy ounces	273	230	All to United States.
Zinc:			
Ore and concentrate, gross weight[4]	NA	46,623	Japan 20,001; United States 19,914; Netherlands 5,000.
Metal including alloys, all forms	58	--	
Other:			
Ash and residue containing nonferrous metals	99	234	Guatemala 73; United States 62; West Germany 50.
Metals including alloys, all forms	1	--	
NONMETALS			
Cement	70,863	29,558	Belize 8,679; Jamaica 8,249; Panama 4,302.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	--	2	All to Nicaragua.
Products	--	16	Do.
Fertilizer materials, manufactured:			
Nitrogenous	26	162	All to Guatemala.
Phosphatic	--	1	Do.
Potassic	--	44	Do.
Salt	1,233	1,634	Costa Rica 1,526.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	9	11	Nicaragua 6; United States 5.
Worked	16	--	
Other including quartz	--	2	All to United States.
Other nonmetals, n.e.s., building materials	478	3,644	Panama 2,805; Ecuador 757.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels	1	--	
Kerosine ---do	15	--	
Distillate fuel oil ---do	30	--	
Residual fuel oil ---do	1,325	1,322	Dominican Republic 928; Panama 364.
Lubricants ---42-gallon barrels	r 300	341	Nicaragua 300; Guatemala 41.
Other:			
Liquefied petroleum gas ---do	22,161	6,771	Guatemala 3,470; Belize 3,301.
Pitch, resin, asphalt and coke from petroleum ---do	--	2,503	All to Belize.

r Revised. NA Not available.
[1] Contains 41 tons antimony metal in 1973, and 223 tons in 1974.
[2] Contains 17,691 tons of lead, 43 tons of zinc, and 2,344,996 troy ounces of silver in 1973; contains 22,827 tons of lead, and 2,995,885 troy ounces of silver in 1974.
[3] Contains 14,075 troy ounces silver metal.
[4] Contains 21,544 tons zinc, 347 tons lead, 127 tons cadmium, and 759,543 troy ounces silver in 1973; 18,390 tons zinc, 638 tons lead, 113 tons cadmium, and 711,631 troy ounces silver in 1974.

Table 4.—Honduras: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum metal including alloys, all forms	836	1,041	United States 596; Austria 71; Puerto Rico 62.
Copper:			
Ore and concentrate	(1)	--	
Copper sulfate	62	59	United States 46; France 11.
Metal including alloys, all forms	49	135	United States 100.
Iron and steel metal including alloys, all forms:			
Scrap	2	1	All from United States.
Other	r 47,763	51,067	Belgium-Luxembourg 17,796; United States 8,872; Japan 7,881.
Lead:			
Ore and concentrate	(1)	--	
Metal including alloys, all forms	164	263	United States 93; Mexico 86; Japan 31.
Mercury ____76-pound flasks	--	3	All from United States.
Nickel metal including alloys, all forms	(1)	(1)	Do.
Platinum-group metals (excluding silver):			
Ore and concentrate ____troy ounces	--	129	All from Guatemala.
Silver metal including alloys ____do	2,829	2,701	All from United States.
Tin metal including alloys, all forms	12	9	United States 3; United Kingdom 2.
Zinc metal including alloys, all forms	1,081	454	Belgium-Luxembourg 186; Netherlands 100; Japan 87.
Other:			
Ore and concentrate	--	1	Mainly from United States and Nicaragua.
Ash and residue containing nonferrous metals	--	(1)	All from Netherlands.
Metals including alloys, all forms	24	417	Mainly from United States.
NONMETALS			
Abrasives, natural, n.e.s	35	41	West Germany 15; United States 13.
Asbestos	1,350	2,334	All from Canada.
Cement	3,828	1,992	Belgium-Luxembourg 623; Japan 607; West Germany 549.
Clays and clay products (including all refractory brick):			
Crude, kaolin and other clays or earth	r 1,182	1,816	United States 914; Guatemala 894.
Products including nonclay bricks	1,267	1,281	United States 512; Nicaragua 297; Guatemala 200.
Diamond, industrial ____kilograms	2	--	
Diatomite and other infusorial earth	r 1,717	899	Nicaragua 559; United States 209; Mexico 101.
Fertilizer materials:			
Crude, phosphatic	7	22	United States 17; West Germany 5.
Manufactured	45,978	39,384	Netherlands 11,695; West Germany 9,614; United States 6,026.
Graphite, natural	(1)	2	Mainly from Netherlands and Guatemala.
Gypsum and plasters	21	92	Guatemala 52; United States 40.
Lime	429	715	West Germany 691.
Mica, worked	1	1	All from United States.
Pigments, mineral, natural, crude	6	12	All from West Germany.
Precious and semiprecious stones, except diamond ____troy ounces	579	1,865	Guatemala 1,447; France 193.
Salt	405	349	United States 291; West Germany 30.
Sodium and potassium compounds:			
Caustic soda	2,091	1,702	Nicaragua 839; United States 487; West Germany 224.
Soda ash	958	893	United Kingdom 632; Guatemala 111; Netherlands 106.
Caustic potash	17	85	Mainly from United States.
Stone, sand and gravel:			
Dimension stone, all forms	r 239	91	All from Guatemala.
Sand (including ground quartz)	17	641	Panama 600.
Other stone	72	427	France 399.
Sulfur:			
Elemental, all forms	--	(1)	All from West Germany.
Sulfuric and sulfurous acids	263	450	West Germany 205; United States 141; Netherlands 94.

See footnotes at end of table.

Table 4.—Honduras: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Talc and steatite	58	100	United States 22; Italy 20; People's Republic of China 16.
Other nonmetals, n.e.s.:			
Crude	101	68	West Germany 60; United States 7.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	466	525	Guatemala 391; United States 60.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	(1)	--	
Coal and coke including briquets	201	278	Colombia 153; West Germany 50; United States 33.
Hydrogen	13	28	West Germany 14; United States 14.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	r 4,782	4,303	Venezuela 3,807; Netherlands Antilles 496.
Refinery products:			
Gasoline do	59	71	Netherlands Antilles 47; United States 18.
Kerosine and jet fuel do	3	5	Netherlands Antilles 2; Nicaragua 2.
Distillate fuel oil do	291	253	Netherlands Antilles 222; United States 28.
Residual fuel oil do	(1)	21	Netherlands Antilles 20.
Lubricants do	61	52	United States 36; Jamaica 9; Netherlands Antilles 6.
Other:			
Liquefied petroleum gas do	1	1	All from Nicaragua.
Mineral jelly and wax do	9	12	United States 7; Japan 4.
Unspecified do	40	52	Netherlands Antilles 46; United States 5.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	2,503	5,632	United States 4,823.

r Revised.
1 Less than ½ unit.

NICARAGUA

Despite a recession in several key sectors, including mining, the Nicaraguan economy as a whole had a 1.5% real growth in 1975. A major depressant was the collapse of the construction boom, which followed the destruction of Managua in the 1972 earthquake. Annual production of portland cement decreased from the 1974 record of 235,732 tons to 193,488 tons.

The large increase in the price of petroleum imports had a strong impact on the negative trade balance. All of Nicaragua's crude and partly refined petroleum came from Venezuela. Esso Standard Oil, S.A., a subsidiary of Exxon Corp., operated the only refinery in Nicaragua at 22,000 barrels per day. During 1975 the offshore potential of Nicaragua drew considerable attention from several interested oil companies, with about 30 concessions being granted.

Plans for a larger increase in public investment were underway, due to the infrastructure needs required for economic development. Since almost two-thirds of the country's electric power was being generated from petroleum-fed powerplants (the remainder was hydroelectric) the cost of electricity in Nicaragua was the highest in Central America. The Government and the National Power and Light Co. gave the development of alternative sources of power the highest priority.

One such project, a hydroelectric dam on the Rio Grande de Matagalpa, was being designed and the construction of it was planned to begin within 2 years. Another such project, the Momotombo geothermal project, involved the drilling of wells to produce enough steam to generate 10 megawatts of electric power, and plans were proposed to drill additional wells to reach 50 megawatts within tne next 2 years.

Rosario's Rosita mine was converted from copper production to gold production in March 1975 after the world price of copper dropped to about 50 cents per pound. During most of the remainder of the year gold-silver ores mined from surface workings at the Riscos de Oro, Blag, and California ore deposits were milled at the Rosita flotation mill while a cyanide plant with a 500-ton-per-day capacity was erected as an addition to the Rosita mill. Rosario started shaft sinking at the Blag and Riscos de Oro gold-silver veins in order to develop the underground reserves which were disclosed the previous year.

Rosario also continued work at the Siuna mine to dewater the open pit and underground workings. This former gold producer was shut down in 1968 following the loss of the hydroelectric plant in a flood. Restoration and repair of the mill buildings was started. Exploration drilling and other surface work indicated additional areas of interest.

At Noranda's Empresa Minera de El Setentrion gold mine, 129,000 tons of ore averaging 0.5-troy ounce gold per ton were treated to produce 59,400 troy ounces of gold. At yearend proven ore reserves were 209,000 tons of similar grade.

Neptune Mining Co.'s mill treated 181,-138 tons of sulfide ore grading 0.10 troy ounce of gold and 0.60 troy ounce of silver per ton, 1.0% lead and 7.2% zinc, and 31,764 tons of gold ore grading 0.15 troy ounce of gold per ton. The sulfide mines' reserves at yearend 1975 were estimated at 1,169,118 tons of ore grading 1.23% lead, 9.78% zinc, 0.44% copper and 0.108 troy ounce gold and 0.84 troy ounce of silver per ton. Gold ore reserves were estimated at about 61,000 tons grading 0.411 troy ounce of gold per ton.

Cerro Minas de Cerro Dorado started work on the former Santa Rosa gold-silver mine. A diamond drill and equipment for a 15-ton-per-day pilot plant were moved to the property.

Table 5.—Nicaragua: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum metal including alloys, all forms	35	36	Mainly to Honduras.
Copper:			
Ore and concentrate	6,730	6,862	All to West Germany.
Metal including alloys, all forms	(1)	(1)	All to Honduras.
Iron and steel metal:			
Scrap	528	1,087	Mainly to El Salvador.
Semimanufactures	4,868	3,511	El Salvador 1,146; Guatemala 993; Honduras 848.
Lead:			
Ore and concentrate	4,485	8,459	All to United States.
Metal including alloys, all forms	10	13	All to Honduras.
Silver metal, worked and partly worked troy ounces	144,550	197,759	Canada 142,267; United States 55,492.
Zinc:			
Ore and concentrate	27,932	33,579	United States 23,017; Belgium-Luxembourg 10,562.
Metal including alloys, all forms	15	115	Mainly to Netherlands.
Other scrap and waste of nonferrous metals	4,503	988	United States 571; West Germany 200; Costa Rica 113.
NONMETALS			
Abrasives, natural	9	--	
Cement	10,927	2,261	Mainly to Costa Rica.
Clay products:			
Refractory (including nonclay bricks)	34	20	All to Costa Rica.
Nonrefractory	1,979	3,418	Mainly to Costa Rica.
Diatomite	1,572	565	All to Honduras.
Feldspar and related materials	35	16	All to Costa Rica.
Fertilizer materials:			
Crude, nitrogenous	3	5	All to El Salvador.
Manufactured:			
Nitrogenous	10	55	All to Honduras.
Phosphatic	284	70	Do.
Gypsum and plasters	13,352	13,814	All to Costa Rica.
Lime	392	731	Do.
Salt	19,017	8,058	Do.
Sodium and potassium compounds, caustic soda	14,169	22,533	Guatemala 8,233; El Salvador 6,274; Costa Rica 4,632.
Stone, sand and gravel:			
Dimension stone, crude and partly worked	22	191	All to Costa Rica.
Sand, including ground quartz	21	--	
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline 42-gallon barrels	2,272	1,851	Honduras 1,539; United States 215.
Kerosine do	18,989	12,999	Costa Rica 9,224; Honduras 1,362.
Distillate fuel oil do	689	2,536	Honduras 2,190; El Salvador 308.
Lubricants do	2	3	All to United States.
Other:			
Liquefied petroleum gas do	44,185	25,105	Mainly to Costa Rica.
Pitch, resin, petroleum asphalt, petroleum coke, and other byproducts of coal and petroleum, n.e.s. do	202,278	110,431	Do.
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	926	3,086	Guatemala 1,231; El Salvador 1,139.

[1] Less than ½ unit.

Table 6.—Nicaragua: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum metal including alloys, all forms	1,077	1,689	United States 499; West Germany 191; Austria 128.
Copper:			
Ore and concentrate	1	(1)	Mainly from United States.
Copper sulfate	150	124	Do.
Metal including alloys, all forms	73	154	Norway 54; West Germany 38; United States 29.
Iron and steel metal:			
Scrap	4	4	Mainly from Costa Rica.
Primary forms	11,584	17,442	United States 8,912; France 5,076; Belgium-Luxembourg 3,449.
Semimanufactures	54,591	74,778	United States 35,943; Japan 20,350; Belgium-Luxembourg 10,463.
Lead metal including alloys, all forms	251	207	Mexico 152; El Salvador 19.
Nickel metal including alloys, all forms kilograms	75	1,321	West Germany 1,037; United States 284.
Silver metal, worked and partly worked troy ounces	6,044	9,645	United States 6,848; West Germany 2,604.
Tin metal including alloys, all forms	27	29	Mainly from United Kingdom.
Zinc metal including alloys, all forms	815	1,220	United States 741; Korea (not further identified) 203; Belgium-Luxembourg 141.
Other:			
Ore and concentrate of base metals, n.e.s	1	(1)	Mainly from United States.
Scrap of nonferrous metals	30	14	Mainly from Honduras.
Base metals including alloys, all forms, n.e.s	(1)	13	Mainly from Brazil.
NONMETALS			
Abrasives, natural	220	337	Costa Rica 186; West Germany 130.
Asbestos	1,415	1,170	Mainly from Canada.
Asphalt, natural kilograms	227	--	
Boric acid	5	6	West Germany 3; France 1; Netherlands 1.
Cement	2,008	4,523	Honduras 1,768; Italy 981; United States 525.
Clays and clay products:			
Crude clays, n.e.s	4,564	6,241	United States 4,100; United Kingdom 1,851.
Products:			
Refractory	608	999	United States 697; Mexico 199.
Nonrefractory	208	573	Japan 192; Spain 81; Colombia 70.
Diatomite	244	1,841	United States 1,442; Mexico 396.
Feldspar and related materials	908	1,091	Guatemala 737; Mexico 301.
Fertilizer materials:			
Crude kilograms	321	19,719	Mainly from United States.
Manufactured:			
Nitrogenous	86,479	94,451	Netherlands 32,011; Poland 13,870; Mexico 12,534.
Phosphatic	34,117	29,528	United States 14,763; Costa Rica 10,990.
Potassic	9,472	5,556	United States 2,728; Costa Rica 1,523; West Germany 1,305.
Other including mixed	5,462	12,531	United States 9,476; Costa Rica 2,234.
Graphite, natural	4	4	West Germany 2; United States 2.
Gypsum and plasters	227	315	United Kingdom 217; United States 61.
Lime	1,583	2,580	Mainly from United Kingdom.
Mica, worked, including splittings and waste kilograms	1,104	339	All from United States.
Pigments, mineral, natural	5	(1)	Do.
Precious and semiprecious stones, including diamond kilograms	(1)	2	Mainly from West Germany.
Salt	29,639	32,194	Mexico 20,091; Chile 11,816.
Sodium and potassium compounds, n.e.s	647	803	France 258; United States 194; West Germany 118.
Stone, sand and gravel	333	1,297	Mainly from Costa Rica.

See footnote at end of table.

Table 6.—Nicaragua: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Sulfur:			
Elemental	222	328	United States 195; West Germany 114.
Sulfuric acid	682	727	Mainly from El Salvador.
Talc	244	499	United States 289; Italy 143.
Other, crude nonmetallic minerals, n.e.s	115	3,120	Mainly from United States.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	3	5	United States 3; West Germany 2.
Coal, coke, peat	79	6	Mainly from United States.
Hydrogen, helium, rare gases kilograms	9,581	5,036	El Salvador 3,600; United States 1,436.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	3,512	4,027	All from Venezuela.
Refinery products:			
Gasoline do	102	106	Netherlands Antilles 71; Netherlands 12; Panama 11.
Kerosine do	95	21	Netherlands Antilles 10; Panama 6.
Distillate fuel oil do	358	228	Panama 106; Trinidad 66; United States 23.
Lubricants do	70	61	United States 33; Jamaica 15; Netherlands Antilles 12.
Other:			
Liquefied petroleum gas do	(1)	(1)	Mainly from United States; Belgium-Luxembourg.
Mineral jelly and wax do	15	19	Mexico 6; West Germany 4.
Pitch, resin, petroleum asphalt and other residues do	1	1	Mainly from United States.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals do	6,187	4,655	United States 2,144; Netherlands Antilles 1,800.

[1] Less than ½ unit.

PANAMA

At yearend 1975 Panama's major mineral industries were still limited to the production of building materials, salt, and petroleum refining. But the development of Cerro Colorado, a porphyry copper ore body located in the Province of Chirique, had been drawing considerable interest since its discovery in the 1960's. During 1975 the Government of Panama and Pavonia Exploration, S.A., the Panama subsidiary of Canadian Javelin Ltd. failed to agree on a contract to develop the mine. The Government spokesman cited two points of disagreement on the talks. First, Javelin's participation in the profits of the operation and second the duration of the operation. Since no agreement was reached, Javelin's participation in the venture was terminated. Javelin was compensated with $5 million in cash plus $18.6 million worth of 8% tax-free 20-year direct obligation bonds of Panama.

At yearend 1975 tentative agreements were reached with Texasgulf, Inc., for the development of Cerro Colorado. Under terms of the agreements, Texasgulf, as manager, was to initially conduct a feasibility study of the project for a fee. Texasgulf was to have a 20% equity participation in the project, and would have a management contract to construct the project and manage it for 15 years after startup. The Panamanian Government was to retain 80% ownership with an option to buy Texasgulf's share after 20 years. The deposit reportedly contained over 1 billion tons of ore grading 0.6% copper with some molybdenum and precious metals. The first phase of the project was planned to include a mine, concentrator, smelter, and refinery to produce 150,000 tons of copper metal per year. In a later phase, a phosphate fertilizer complex was contemplated, using sulfuric acid from the copper smelter. Texasgulf was to have a 49% interest in this phase.

In the Petaquilla area of Colón Province, Cobre Panamá, S.A., which was formed by Japanese interests headed by Mitsui Mining

& Smelting Co., Ltd., completed several diamond drill holes at a porphyry copper deposit.

Tuquesa Mining, S.A., a U.S. based company, was granted a 15-year concession to exploit the placer gold deposits in Darien Province covering an area of 3,750 acres. The company had been conducting exploration for the past 5 years. Pending completion of the Panamanian Highway, the site was only accessible by plane.

A local subsidiary of Texaco, Inc., and Panama signed a contract for offshore petroleum exploration in the Caribbean. Four exploratory wells were to be drilled over a period of 3 to 7 years.

Table 7.—Panama: Imports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys, all forms	432	NA
Copper metal including alloys, all forms	2,458	468
Gold metal, unworked or partly worked ----- troy ounces	NA	2,476
Iron and steel:		
Primary forms	6,158	3,976
Semimanufactures	r 57,069	94,794
Lead metal including alloys, all forms	276	661
Tin metal including alloys, all forms	NA	132
Zinc metal including alloys, all forms	759	764
Other: Metals including alloys, all forms	978	635
NONMETALS		
Asbestos	431	340
Cement	6,374	13,425
Clays and clay products (including all refractory bricks):		
Crude clays, n.e.s	NA	749
Products:		
Refractory (including nonclay bricks)	892	977
Nonrefractory	762	592
Diamond, industrial ----- value, thousands	NA	$109
Fertilizer materials, manufactured:		
Nitrogenous	15,885	16,560
Phosphatic	NA	557
Potassic	2,570	5,742
Other including mixed	29,984	38,848
Gypsum	NA	25,050
Precious and semiprecious stones, except diamond ----- kilograms	40	77
Salt (excluding brine)	4,051	655
Stone, sand and gravel	NA	1,208
MINERAL FUELS AND RELATED MATERIALS		
Coal, all grades including briquets	12,326	NA
Coke and semicoke	NA	533
Petroleum:		
Crude and partly refined ----- thousand 42-gallon barrels	r 26,208	25,188
Refinery products:		
Distillate fuel oil ----- do	136	130
Residual fuel oil ----- do	NA	81
Lubricants ----- do	72	72
Other ----- do	10	8
Total ----- do	218	291

r Revised. NA Not available.
[1] Excludes metallic oxides and hydroxides (except zinc oxides) which are reported separately from metallic salts.

The Mineral Industry of Other Areas of the Far East and South Asia

By Staff, Bureau of Mines

CONTENTS

AFGHANISTAN[1]

The mineral industry of Afghanistan has traditionally accounted for less than 6% of the gross national product (GNP), which in 1975[2] was about $1.6 billion.[3] Of the mineral deposits known to exist in Afghanistan, only natural gas, coal, salt, and lapis lazuli were mined in significant quantities in 1975. Potentially important deposits of iron ore, copper, beryl, and chromite remained largely unexploited. Other minerals of value to the domestic economy included marble, talc, and barite; all were produced in small quantities in 1975. The balance of activity in Afghanistan's mineral sector consisted of the production of cement and fertilizers.

The most significant development in 1975 was Iran's offer to finance construction of a railway system linking landlocked Afghanistan with Iran's transportation network and its Persian Gulf ports. The project, which was estimated to cost $1 billion, was scheduled for completion in 1983. In its initial stage, the railway was to run from the Iranian border point of Islam Qala to Herat in western Afghanistan, south to Kandahar, and then north to the capital Kabul. In its second stage, several branch lines were envisaged with top priority given to one opening up the Hajigak iron ore deposits 140 kilometers northwest of Kabul. Other extensions were to provide links with the railway systems of the Soviet Union and Pakistan. The proposed railway system would provide Afghanistan with an alternative trade route to the traditional transit arrangements with Pakistan.

The Afghan Government, in 1975, invited international bids for the exploration and exploitation of mineral resources in various parts of the country, with particular emphasis given to oil and natural gas. To govern these activities, a law was passed creating the Afghanistan National Oil Company (ANOC). Among ANOC's responsibilities were the development and implementation of a National Petroleum Law, all negotiations with foreign firms for exploration rights and permits, over-

[1] Prepared by Candice Stevens, economist, International Data and Analysis.
[2] All data are for Afghani calendar year beginning March 21 of year indicated and ending March 20 of following year.
[3] Where necessary, values have been converted from Afghanis (Af) to U.S. dollars at the rate of Af45=US$1.00.

sight of the firms' activities, and determination of the best uses of indigenous oil and gas reserves. The company's charter included the provision that any joint ventures between ANOC and domestic or foreign investors be at least 51% ANOC-owned. This corresponded to a revision made in 1974 to the Foreign and Domestic Private Investment Law requiring that all new ventures be 51% Afghan-owned and that all existing ventures conform to this stipulation after a negotiated interval. At yearend 1975, few ventures had been approved under the revised act.

In April, the Afghan Government granted what was believed to be the first exploration license to a western company. France's Compagnie Française des Pétroles (CFP) was awarded a 20,000-square-kilometer exploration area in the Katawaz Basin in the southeast, which constituted a geological extension of CFP's exploration tract in northern Pakistan. As part of the agreement, CFP contracted to train Afghan personnel in oil and gas technology in France, to make maximum use of the local Afghan labor force, and to carry out the future production and transfer of gas and/or oil commodities within the framework of joint companies.

Natural gas maintained its position as Afghanistan's most important mineral commodity in 1975, with production totaling almost 3 billion cubic meters. Under an agreement signed in February 1975, a total of 2.8 billion cubic meters was exported to the Soviet Union; the remainder was used in domestic power production and to fuel the Mazar-i-Sharif fertilizer plant. Export earnings from natural gas increased greatly in 1975, from $26.29 million in 1974 to $46.80 million, due to a doubling of the Soviet price paid for the commodity. The combined reserves of Afghanistan's five principal gas deposits, all situated in the northern part of the country just south of the Soviet border, were estimated at 100 billion cubic meters. In 1975, production was concentrated in the Khwaja-Gogirdak Field, while drilling continued at the Yatim Tag, Khwaja-Borhan, Juma, and Jarqduq Fields.

Afghanistan's natural gas production facilities were financed by the Soviet Union, which also assisted in the construction of a pipeline extension completed in 1975. The new surface pipeline, which had an annual capacity of more than 4 billion cubic meters of gas, spanned the Amu Darya River to link the Khwaja Gogirdak wells with the Turkmenistan area of the Soviet Union. The Soviet Union further contributed to the construction of two gas treatment plants, one at Khwaja Gogirdak, which was completed in 1975, and one at Jarqduq Field in Jowzjan Province, to be opened in 1976.

Afghanistan had no crude oil output in 1975 and a flow of only about 150 barrels per day of condensate from the Sar-i-pul Field in southern Jowzjan Province. The Soviet Union provided Afghanistan with nearly all its petroleum product requirements, which were estimated at about 2 million barrels. The search for indigenous petroleum resources continued in 1975, and exploratory drilling indicated a second oil-bearing area in the Aq Darya District of Jowzjan Province. Reserves of 2.5 million tons of recoverable oil had previously been discovered at Angut, approximately 7 kilometers from Aq Darya. Details pertaining to the oil refinery planned for Jowzjan Province were also announced in 1975. Afghanistan's first oil refinery was to be located 65 kilometers from the Angut and Aq Darya Fields and to be built with Soviet technical assistance. The refinery was scheduled to process approximately 1,400,000 barrels of crude oil and produce about 728,000 barrels of fuel oil, 371,000 barrels of diesel oil, 133,000 barrels of tar, 91,000 barrels of gasoline, and 42,000 barrels of kerosine per year.

Eleven coal deposits with total reserves of 300 million to 500 million tons have been identified in Afghanistan, but only four of these were believed to be of potential importance in meeting future energy demands. The Karkar, Ishpushta, and Darra-i-Suf mines, located in northeast Afghanistan, accounted for the total 1975 output of about 160,000 tons. The Sabzak deposit, near Herat, which was estimated to contain reserves of 9 million tons of coal, had yet to be exploited owing to its more isolated location.

Afghanistan's salt production began in 1954 and rose steadily to a level of 60,000 tons in 1975, an increase of 20% over the 1974 level. Approximately two-thirds of this output was rock salt from the opencast mines near Tallequan in Takhar Province, while the balance was brine salt from salt lakes near Herat, Andkhoi, and Kandahar.

The surveying of Afghanistan's several gem stone deposits progressed in 1975, but lapis lazuli continued to be the only one of significance with reserves estimated at 1,300 tons. Afghanistan has consistently been the world's leading producer of lapis lazuli. In 1975, production at the State-controlled mines in the northeast Province of Badakhshan was approximately 8 tons of jewelry-grade lapis lazuli, most of which was exported. Other gem minerals that were explored on a preliminary basis during 1975 were ruby deposits in the Jegdalek area east of Kabul, emerald deposits in the Nooristan and Panjshir Districts, kunzite in the Kulam Valley of Nooristan and in Nangarhar Province, and aragonite-onyx deposits southwest of Lashkargah.

Small amounts of marble, talc, and barite were extracted in 1975. Marble was mined commercially at three locations in Afghanistan: Near Kandahar, outside Kabul, and in Nangarhar Province. Annual output in 1975 and previous years averaged about 10,000 tons, most of which was used by the domestic construction industry. The production of both barite and talc was reported for the first time in 1974. The output of talc from deposits in Shinwar and Nagarhar increased from 3,000 tons in 1974 to 6,300 tons in 1975. Two deposits of barite were identified, one in the Farinjal area of Ghorband and the other in the Sanglon area of Herat, but the 1975 production of 5,200 tons was derived primarily from the Sanglon mine.

Afghanistan's only other commercially significant mineral commodities in 1975 were cement and fertilizers. The total output of Afghanistan's two cement plants, the Ghouri plant near Pul-i-Khumri and the Jabal-i-Seraj plant north of Kabul, remained at the 1974 level of approximately 140,000 tons. Aside from domestic use in Government and private construction projects, about 40% of cement production was exported to the Soviet Union and Iran. At yearend 1975, the Government was considering projects for the expansion of the Ghouri facility and for the construction of a third cement plant, with the expectation of making cement a principal export item.

Approximately 45,000 tons of urea fertilizer and diammonium phosphate from Afghanistan's single fertilizer plant at Mazar-i-Sharif was distributed to farmers throughout the country during 1975. The Mazar-i-Sharif facility, which opened in July 1974 at an annual capacity of 105,000 tons, was under the operation of the State-owned Afghan Chemical Fertilizer Co. In an agreement concluded in December, an expected 15,000 tons of fertilizer was to be exported to the Soviet Union during 1976. Also under negotiation was a joint Soviet-Afghan project for the construction of a second artificial fertilizer plant in the northern part of the country.

The most significant potential addition to Afghanistan's mineral industry comprised the Hajigak iron ore deposits, situated in the Hindu Kush Mountains northwest of Kabul. Reserves were estimated at 2 billion tons with an average iron content of more than 60%. The lack of infrastructure has thus far made the cost of developing these reserves prohibitive.

The appraisal of reserves at the copper deposits at Ainak in Lowgar Province was also favorable, and exploitation of the deposits together with the construction of a copper smelter was planned for 1977. Reserves were estimated at between 1.5 million and 2 million tons grading 1.3% copper. Surveying also took place at the Darbard and Jowhar copper deposits, both in the general vicinity of Ainak. Total copper reserves in the Kabul region were estimated at 3.5 million tons.

Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities

Area,[1] commodity, and unit of measure	1973	1974	1975 [p]
AFGHANISTAN [2 3]			
Barite ---thousand metric tons--	NA	10	5
Cement, hydraulic ---do---	141	146	140
Coal, bituminous ---do---	114	153	160
Fuel briquets (produced from a portion of domestically mined coal) ---do---	10	NA	NA
Gas, natural marketed production ---million cubic feet--	[r] 98,900	102,412	98,900
Gem stone, lapis lazuli ---kilograms--	NA	8,500	8,000
Natural gas liquids ---thousand 42-gallon barrels--	13	[e] 15	[e] 15
Salt, all types [4] ---thousand metric tons--	38	51	60
Stone, marble traso ---thousand square meters--	57	NA	NA
Talc ---thousand metric tons--	--	3	6
BANGLADESH [2]			
Cement, hydraulic ---do---	30	85	93
Clays (china clay) ---metric tons--	6,096	1,200	3,384
Fertilizer materials, manufactured: [5]			
Gross weight [e] ---thousand metric tons--	198	280	71
Nitrogen content ---do---	92	130	33
Gas, natural, marketed production [6] ---million cubic feet--	32,000	17,223	33,000
Iron and steel:			
Crude steel ---thousand metric tons--	61	81	NA
Mild steel products ---do---	[r] 105	140	NA
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels--	260	369	373
Jet fuel ---do---	--	105	124
Kerosine ---do---	613	782	1,258
Distillate fuel oil ---do---	574	522	895
Residual fuel oil ---do---	1,656	1,424	2,026
Other:			
Naphtha ---do---	223	81	429
Unspecified ---do---	184	269	208
Refinery fuel and losses ---do---	423	281	459
Total ---do---	3,933	3,833	5,772
Salt, marine ---thousand metric tons--	[e] 757	169	746
Stone, limestone, industrial ---do---	64	81	70
BRUNEI [2]			
Gas, natural:			
Gross production ---million cubic feet--	[e] 220,000	243,811	268,390
Marketed production ---do---	101,670	176,820	214,394
Natural gas liquids:			
Condensate ---thousand 42-gallon barrels--	1,253	2,083	2,566
Natural gasoline ---do---	420	431	397
Liquefied petroleum gas ---do---	180	186	143
Total ---do---	1,853	2,700	3,106
Petroleum:			
Crude ---do---	78,673	70,338	65,932
Refinery products:			
Gasoline ---do---	133	119	160
Distillate fuel oil ---do---	203	238	221
Residual fuel oil ---do---	1	1	1
Other ---do---	38	46	40
Refinery fuel and losses ---do---	--	—1	1
Total ---do---	375	403	423
CAMBODIA [2]			
Cement, hydraulic ---thousand metric tons--	78	[e r] 50	[e] 50
Gold, mine output, metal content [e] ---troy ounces--	4,000	4,000	500
Salt [e] ---metric tons--	31,000	30,000	30,000
HONG KONG [2]			
Cement, hydraulic ---thousand metric tons--	441	571	575
Clays, kaolin ---metric tons--	[r] 6,759	3,320	1,490
Feldspar ---do---	1,340	5,566	2,059
Iron ore and concentrate, gross weight ---do---	150,713	159,737	167,200
Quartz ---do---	[r] 1,015	351	761
LAOS [2]			
Salt, rock ---do---	8,640	9,600	[e] 10,000
Tin: Mine output, metal content ---do---	748	612	522
MONGOLIA [2]			
Cement, hydraulic ---thousand metric tons--	146	171	[e] 175

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	1973	1974	1975 [p]
MONGOLIA [2]—Continued			
Coal:			
Anthracite and bituminous thousand metric tons	118	137	[e] 140
Lignite and brown do	2,206	2,337	[e] 2,400
Total do	2,324	2,474	2,540
Fluorspar, all grades [e] metric tons	240,000	[r] 250,000	302,000
Gypsum [e] do	25,000	25,000	25,000
Lime, quicklime and hydrated [e] do	40,000	40,000	40,000
Petroleum refinery products:			
Kerosine [e] thousand 42-gallon barrels	23	[r] 16	NA
Residual fuel oil [e] do	[r] 20	[r] 13	NA
Total of listed figures [e] do	[r] 43	[r] 29	NA
Salt metric tons	11,000	11,000	[e] 11,000
SINGAPORE [3]			
Cement, hydraulic thousand metric tons	1,028	[e] [r] 1,100	[e] 1,100
Iron and steel:			
Crude steel do	204	[e] [r] 240	[e] 240
Semimanufactures (rolled only) do	302	NA	NA
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	18,374	28,299	18,111
Jet fuel do	30,729	21,525	19,460
Kerosine do	13,604	4,583	5,587
Distillate fuel oil do	37,724	32,280	37,112
Residual fuel oil do	76,133	53,665	39,956
Lubricants do	2,375	1,642	2,118
Other do	10,452	8,261	11,683
Refinery fuel and losses do	4,416	6,433	5,048
Total do	193,807	156,688	139,075
Stone, granite, broken thousand cubic meters	1,778	1,795	2,302
Sulfur, byproduct from oil refinery [e] metric tons	6,000	6,000	6,000
SRI LANKA			
Cement, hydraulic thousand metric tons	422	474	363
Clays:			
Ball metric tons	1,090	NA	1,423
Kaolin do	13,881	5,888	2,682
Other [7] do	NA	NA	60,090
Coke, gashouse thousand metric tons	7	[e] 7	[e] 7
Feldspar, crude and ground metric tons	625	779	1,270
Gem stones, precious and semiprecious except diamond thousand carats	478	([8])	([8])
Graphite, all grades metric tons	[r] 7,811	10,427	11,982
Mica, scrap do	272	180	26
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	1,041	829	746
Jet fuel do	326	454	439
Kerosine do	1,954	1,572	1,610
Distillate fuel oil do	3,035	2,670	2,702
Residual fuel oil do	4,452	3,964	3,580
Other do	1,293	1,059	1,068
Refinery fuel and losses do	889	709	746
Total do	12,990	11,257	10,891
Rare-earth minerals, monazite concentrate, gross weight metric tons	--	6	7
Salt do	[r] 123,000	120,000	121,000
Sand and gravel, glass sand do	NA	43	NA
Stone:			
Dolomite do	6,102	NA	3,136
Limestone thousand metric tons	697	784	714
Quartz, massive metric tons	434	305	296
Titanium:			
Ilmenite concentrate, gross weight do	93,482	81,098	64,010
Rutile concentrate, gross weight do	2,252	3,051	3,111
Zirconium concentrate, zircon, gross weight do	28	21	39
VIETNAM, NORTH [9]			
Cement, hydraulic [e] thousand metric tons	500	600	650
Coal, anthracite [e] do	3,000	[r] 3,500	4,000
Fertilizer materials, crude, phosphatic, phosphate rock [e] do	500	1,200	1,400
Salt [e] do	150	150	150
Tin:			
Mine output [e] metric tons	[r] 200	250	250
Smelter output [e] [10] do	150	200	200

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	1973	1974	1975 p
VIETNAM, SOUTH			
Cement, hydraulic thousand metric tons	265	e 100	e 50
Clays:			
Kaolin e 11 metric tons	1,000	1,000	1,000
Lateritic thousand cubic meters	394	NA	NA
Other do	e 836	NA	NA
Gypsum e metric tons	7,000	7,000	7,000
Salt, marine thousand metric tons	200	e 200	e 200
Sand and gravel:			
Silica sand e thousand cubic meters	195	NA	NA
Other sand and gravel e do	1,085	NA	NA
Stone: 12			
Basalt, rhyolite do	22	NA	NA
Granite and porphyry e do	433	NA	NA
Limestone do	r 1,500	NA	NA
Sandstone thousand metric tons	e 100	NA	NA
Schist do	e 80	NA	NA
Quartz do	1	NA	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] Data for years beginning April 21 of that stated.

[5] For the year ended June 30 of that stated.

[6] 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.

[7] For cement production only.

[8] Value only reported at $23,821,974 in 1974 and $19,964,571 in 1975.

[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 or 1975.

[12] Additional varieties of stone are produced, but production statistics are not available, and general information is inadequate to make reliable estimates of output levels.

Table 2.—Afghanistan: Estimated imports of petroleum refinery products [1]

(Thousand 42-gallon barrels)

Commodity	1972	1973	1974
Gasoline, all grades	1,210	1,270	1,201
Jet fuel and kerosine	344	420	485
Distillate fuel oil	967	991	875
Residual fuel oil	200	225	268
Lubricants	38	48	40
Other	124	115	121
Total	2,883	3,069	2,990

[1] Data revised to agree with that appearing in the International Petroleum Annual for years 1972–74.

BANGLADESH [4]

During 1975, Bangladesh experienced serious political problems which involved several changes in leadership. By yearend, stability was restored and the new Government was able to address the challenge of feeding its more than 80 million citizens. The annual population growth of over 3% hampered economic gains made in recent years, and the balance of payments deficit climbed to around $1 billion in 1975. The population density rose to 2,300 per arable square mile, with nearly 90% of the people dependent on agriculture for livelihood. Bangladesh was one of the least industrialized of the world's more populous countries. The manufacturing industry contributed only about 10% of the GNP, and most of this was from processing a limited number of agricultural products.

The mineral industry contributed very little to the overall economy, although hydraulic cement, kaolin (china clay), salt, crude steel, and natural gas all recorded healthy gains in output.

Natural gas was the only mineral product of consequence. While the seven known gasfields were not fully developed, the reported reserve of 300 billion cubic meters was sufficient to support substantially increased production for many years. Gross production for 1975 was reported to be 934 million cubic meters, or an average of 90 million cubic feet per day. The major consumption was as a feedstock and fuel for nitrogenous fertilizer production, and as a fuel in the generation of electric power. The Government was looking into the use of natural gas for firing bricks. Construction bricks were in short supply, and currently the industry uses imported coal for firing its kilns.

Expansion of the gas pipelines network progressed satisfactorily with nearly 200 kilometers of new pipeline being laid. Reconstruction of a permanent 35-centimeter-diameter pipeline across the Meghna Bridge was completed. Previously, gas supplies to Dacca were delivered through small temporary lines because the main line was damaged during the "War of Liberation." In addition, a connection was made from the Chhatak gasfield to the Chhatak Bazar pulp and paper mill. Plans were being made to expand the pipeline network in the greater Dacca area and to provide a connection for a proposed nitrogen fertilizer plant at Ashuganj. An 80 kilometer pipeline was planned to service the major port of Chittagong.

The only petroleum refinery in the country, located at Chittagong, runs entirely on imported crude oil. Because of higher cost for crude and a complete refinery overhaul in October and November, the refinery input was cut back to about 800,000 tons per year. Imports of refined petroleum products were estimated at 400,000 tons in 1975, compared with 600,000 tons in 1974. The refinery planned to install a 12,000-ton-per year liquefied petroleum gas (LPG) unit to utilize refinery gases that were presently flared. A small amount of naphtha production from the refinery operations was exported for the first time in 1975.

Six foreign oil companies were authorized to conduct oil exploratory work in Bangladesh waters. The State-owned company, Petrobangla, conducted extensive gravity and seismic surveys and some onshore drilling. The first offshore hole was drilled by Bengal Oil Development Corporation, a subsidiary of Japan Petroleum Development Corporation. The site was 40 kilometers offshore, west of the Burma-Bangladesh border. The 4,500-meter well, the deepest drilled to date in the country, was a dry hole. An Atlantic Richfield Co. subsidiary, Arco Bangladesh Inc., also drilled a dry hole offshore late in the year. The company subsequently reduced its resident staff. Other companies were expected to begin offshore drilling early in 1976.

Bangladesh produced no coal, and all coal requirements were met by imports. India was by far the biggest single supplier, having furnished about 700,000 tons during 1975. Large coal deposits exist in the Bogra District at a depth of 1,000 meters or more. Foreign experts were asked to prepare a feasibility study on developing deep-seam coal resources, because domestic capital and technical expertise were not readily available.

Bangladesh produced a little over 700,000 tons of fertilizer, well below the rated capacity of the two operating plants. Construction was due to begin in 1976 on a

[4] Prepared by Gordon L. Kinney, physical scientist, International Data and Analysis.

1,300-ton-per-day urea fertilizer plant at Ashuganj; planned completion date was 1981. Several foreign countries and international agencies were to fund the $200 million project.

The Bangladesh Atomic Energy Commission (BAEC) decided to make a preliminary radiometric survey to identify uranium-thorium occurrences in the Sylhet, Mymensingh, Comilla, Chittagong, and Faridpur Districts, to be followed by geochemical surveys and drillhole-radioactive logging in the promising areas.

BAEC was reportedly sponsoring a detailed study of beach sand deposits near Cox's Bazar. The area was believed to contain more than 2 million tons of heavy mineral sands.

BRUNEI [5]

Brunei's economy continued to be dominated by the production and export of oil and associated natural gas. The country's gross domestic product (GDP) was estimated to be over $1,375 million.[6] Total exports were about $1,150 million, nearly all of which was from the sale of crude oil, natural gas, and petroleum products. Rubber and timber were also exported but contributed little to the overall economy. Imports totaled $262 million and consisted mainly of manufactured goods, machinery, transport equipment, and food.

During the year, the Government increased its equity in Brunei Shell Petroleum Co., Ltd., the country's only oil and gas producer. The exact terms of the new agreement were not released, but it was believed the Government's share was increased from 25% to over 50%. This would considerably increase the Government's share of revenue from oil and gas production.

The Brunei Government planned to diversify the economy and lower the country's nearly total dependence on oil revenues. The start of construction of a $100 million pulp and paper mill at Kuala Belait was delayed by a conflicting proposal to establish a palm oil industry in the same area. The country is virtually without organized commercial agriculture, but proposals were made for developing tapioca and coconut plantations. The Government approved in principle plans for a 1,000-ton-per-day ammonia and urea plant at Muara. The $200 million plant would be based on the use of excess natural gas from oilfield production. Competition from increased European production, however, has put the project in jeopardy.

Revenue from oil sales funded the establishment of the Royal Brunei Airlines, wholly-owned by the Government. The airline consisted of two Boeing 737's which began scheduled flights in May. Establishment of a brickworks was considered during the year. The pressing need for establishing construction industry projects was evident since shortages of cement, bricks, and building materials have delayed completion of Government housing units.

Crude oil production fell 6.3% to 65.9 million barrels in 1975. The reported value of the crude oil was $787.6 million, down about 4% from the 1974 value. The drop in production was due mainly to a well blowout in late 1974 at a Champion Shoals offshore platform. Production from that unit had not been resumed by yearend 1975. Four oilfields produced most of the country's oil. The average production per day for the first 6 months of 1975 was reported as follows: Southwest Ampa Field, 94,000 barrels; Seria Field, 34,000 barrels; Champion Shoals Field, 24,000 barrels; and Fairley Field, 23,000 barrels.

Crude oil reserves for the country were reportedly 1.9 billion barrels at yearend.

Drilling activity, mostly by Brunei Shell Petroleum Co., Ltd., increased by nine wells over that of 1974. Thirty-eight development wells and 12 exploration wells were completed. Four to six offshore rigs worked during the year, but no new oil or gas discoveries were made. Most of the development drilling was done in the Champion Shoals and Southwest Ampa oilfields. Some onshore seismic survey work was begun near yearend.

Gross production of natural gas in 1975 was 7.6 billion cubic meters, or about 735 million cubic feet per day. Most of the gas was produced in conjunction with the

[5] Prepared by Gordon L. Kinney.
[6] Where necessary, values have been converted from Brunei dollars (B$) to U.S. dollars at the rate of B$2.48=US$1.00.

oil production. A considerable amount was consumed or wasted during the production cycle. Sales of liquefied natural gas (LNG) totaled 3,514,000 tons, valued at about $321.8 million. The natural gas was liquefied at the Shell-Mitsubishi LNG plant near Seria. Specially designed tankers were loaded with LNG from an offshore mooring facility in deep water. The entire output of LNG was sold to Japan. Natural gas reserves in Brunei were estimated at 187 billion cubic meters at yearend 1975.

CAMBODIA (FORMERLY KHMER REPUBLIC) [7]

The year opened in Cambodia with intense fighting around the capital of Phnom Penh, but by the end of April the military action was over and a new Government, the Royal Government of National Union of Cambodia, was firmly in place. The new Government inherited a chaotic economy and no food stockpiles to feed the urban population. With imports of food cut off, the Government ordered the immediate evacuation of the more than 2 million people in Phnom Penh to the countryside. Several other major towns across the country were also reportedly evacuated.

Even before the war, minerals and manufacturing had only a minor role in Cambodia's agrarian economy. However, with stable conditions, a variety of minerals might be developed for local and foreign markets. The only significant minerals that have been produced were phosphate rock, cement, gem stones, gold, salt, and nonmetallic construction materials. Continued production of phosphate rock will probably receive priority attention. No mineral production figures were available for phosphate rock, gem stones, or construction materials for the year.

Bauxite occurs in commercial quantities, and there was a plan, based on a United Nations study, to develop an aluminum industry in the Mekong Basin. As yet, the plan has not gone beyond the blueprint stage. In addition, deposits of iron, manganese, gold, copper, and coking-grade coal reportedly have been identified.

Crude oil was not produced domestically. The old 12,000-barrel-per-day French refinery at Kompong Som was damaged during the war, and the Government had not reopened the plant by yearend. Repair and reactivation of the plant after years of neglect would require a considerable outlay of money and technical expertise.

Offshore oil exploration came to a halt during the hostilities, but two holes had been drilled by a subsidiary of France's Essence et Lubrifiant de France—Entreprise de Reserches et d'Activités Pétrolières (Elf-ERAP). The results of the drilling were never announced, but it was reported that the French company was hopeful that the new Government would allow exploration to continue.

HONG KONG [8]

The economy of Hong Kong in 1975 continued to be influenced by soft international market conditions which affected industrial production and exports. The GDP in current prices was $7.2 billion in 1975, compared with $6.8 billion in 1974. In terms of constant 1966 prices, the GDP in 1975 was $3.9 billion, an increase of 2.8% from that in 1974.

Despite efforts to diversify, Hong Kong remained highly specialized in industries and markets. The majority of Hong Kong's manufacturing industries produced light consumer goods. The production of textiles and clothing, electronic components, plastic products, and toys accounted for about 70% of the total industrial workforce and more than 70% of the total domestic exports. The value of textiles and clothing exported amounted to $2.5 billion in 1975.

Hong Kong's foreign trade in 1975 was as follows in billion dollars: Imports, $6.97 billion; domestic exports, $4.68 billion; and reexports, $1.76 billion. Japan, the People's Republic of China, and the United States, in that order, were the major sources of Hong Kong's imports, accounting for $3.64 billion, or 52% of the total. The major export destinations in 1975 were the

[7] Prepared by Gordon L. Kinney.

[8] Prepared by E. Chin, physical scientist, International Data and Analysis.

United States, followed by the Federal Republic of Germany, the United Kingdom, and Australia.

The only mineral industries of any consequence were cement and iron ore. Cement clinker was imported and ground into finished cement by the Green Island Cement Co. at its Hung Hom, Kowloon, plant. In 1975, about 575,000 tons of cement were produced, most of which was locally consumed.

The Ma On Shan mine produced 167,200 tons of iron ore concentrate in 1975, an increase of 7,500 tons over the 1974 output. Because there were no smelting facilities, the ore was exported to Japan. Mo On Shan had been producing iron ore concentrate at an annual rate of 150,000 to 200,000 tons for more than a decade. However, the ore reserves were reportedly being depleted, and the mine was approaching the closure stage.

In addition, about 1,500 tons of kaolin clays, 2,000 tons of feldspar, and 800 tons of quartz were produced in 1975. Output of these minerals was shipped primarily to Taiwan, Thailand, and Indonesia.

Table 3.—Hong Kong: Exports and reexports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite and concentrate	1,756	6,287	Taiwan 6,037.
Oxide and hydroxide	r 187	302	Indonesia 190; Nigeria 100.
Metal including alloys, all forms	r 12,295	18,991	Japan 4,886; Taiwan 2,489; United States 1,992.
Arsenic, trioxide, pentoxide, acids	r 30	17	Taiwan 5; North Vietnam 5; Thailand 3.
Chromium oxide and hydroxide	17	19	Indonesia 10; Taiwan 5.
Cobalt oxide and hydroxide	2	4	People's Republic of China 3.
Copper:			
Oxide and hydroxide	5	2	Malaysia 1.
Metal including alloys, all forms	r 7,723	8,628	Japan 2,650; United States 2,178.
Gold metal, unworked or partly worked thousand troy ounces	448	308	United Kingdom 193; Switzerland 78.
Iron and steel:			
Ore and concentrate thousand tons	159	179	All to Japan.
Scrap do	r 213	246	Japan 97; People's Republic of China 80; Taiwan 48.
Pig iron, steel ingot and similar material do	4	2	Mainly to Malaysia.
Semimanufactures do	r 79	71	Indonesia 33; Malaysia 9.
Lead:			
Oxide	r 17	11	Mainly to Indonesia.
Metal including alloys, all forms	4,193	4,141	Taiwan 1,525.
Magnesium metal including alloys, all forms	113	144	Mainly to United States.
Manganese:			
Oxide	70	30	Mainly to Taiwan.
Nickel:			
Oxide and hydroxide	7	3	Mainly to Thailand.
Metal including alloys, all forms	r 51	218	United States 105; United Kingdom 52; Taiwan 21.
Silver metal including alloys thousand troy ounces	665	2,011	United Kingdom 1,315; Switzerland 277; France 237.
Tin metal including alloys, all forms	r 320	432	Taiwan 168; Singapore 154.
Titanium, oxide	722	609	Taiwan 342; Philippines 58.
Tungsten metal including alloys, all forms	15	7	Mainly to Philippines.
Zinc:			
Oxide	192	81	Japan 37; Indonesia 21; Ghana 10.
Metal including alloys, all forms	1,392	3,077	United States 718; Netherlands 386.
Other:			
Oxides, hydroxides, peroxides of metals, n.e.s	43	92	Mainly to United States.
Metals including alloys, all forms:			
Metalloids	(1)	5	Mainly to Indonesia.
Base metals including alloys, all forms	48	48	Canada 18; Netherlands 13; United Kingdom 10.
NONMETALS			
Abrasives:			
Natural, n.e.s	35	34	Indonesia 12; Taiwan 8; Singapore 8.
Grinding and polishing wheels and stones	r 147	175	Indonesia 94; Philippines 20.

See footnotes at end of table.

Table 3.—Hong Kong: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973 [1]	1974	Principal destinations, 1974
NONMETALS—Continued			
Asbestos	1	21	Mainly to Singapore.
Barite and witherite	2	87	Mainly to Taiwan.
Cement, hydraulic	r 21,726	22,054	Malaysia 7,929; Macao 6,947; Indonesia 6,520.
Clays and clay products including all refractory brick:			
Crude, n.e.s	r 29,941	28,749	Taiwan 26,372.
Products ----value, thousands	$216	$1,727	Nigeria $542; Indonesia $402; Macao $209.
Cryolite and chiolite	--	30	All to Indonesia.
Diamond:			
Gem, not set or strung thousand carats	r 329	381	Israel 93; Japan 73; Belgium-Luxembourg 64.
Industrial ----value, thousands	r $31	$7	Thailand $5; United Kingdom $2.
Diatomaceous earth	48	38	Indonesia 23; Singapore 8; India 7.
Feldspar and fluorspar	r 602	406	Indonesia 263; Thailand 130.
Fertilizer materials:			
Crude	r 159	176	Malaysia 157.
Manufactured	6	1	All to Australia.
Ammonia	2	1	Mainly to Indonesia.
Graphite, natural	1,669	2,031	Mainly to United States.
Gypsum and plasters	60	154	Indonesia 90; Taiwan 52.
Lime	r 285	180	Mainly to Malaysia.
Mica, all forms	r 149	42	Taiwan 27; Republic of Korea 9.
Pigments, mineral, including processed iron oxide	201	452	Indonesia 281; Taiwan 109.
Precious and semiprecious stones, including synthetic, other than diamond ----value, thousands	r $131,544	$88,617	Japan $49,000; United States $15,805.
Salt and brine	r 87	111	Mainly to Malaysia.
Sodium and potassium compounds, n.e.s	r 1,510	9,192	U.S.S.R. 4,320; Philippines 1,254; Indonesia 1,203.
Stone, sand and gravel:			
Dimension stone	1,026	1,545	Macao 427; Indonesia 393; Thailand 323.
Gravel and crushed rocks	6,575	49	Indonesia 27; Philippines 10.
Quartz and quartzite	1,113	608	Thailand 444; Ivory Coast 61.
Sulfur:			
Elemental all forms	107	64	Philippines 44; Macao 11.
Sulfuric acid	6	1	Mainly to Indonesia.
Talc, steatite, soapstone, pyrophyllite	1,109	1,508	Indonesia 999; Philippines 423.
Other nonmetals, n.e.s.:			
Crude	57	189	Nigeria 100; Taiwan 50; Singapore 30.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	r 38	258	Indonesia 210; Bangladesh 48.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon	86	80	Indonesia 50; Thailand 20.
Coal and coke including briquets	12	(1)	Mainly to Singapore.
Petroleum refinery products:			
Gasoline -thousand 42-gallon barrels	r 51	51	All to Macao.
Kerosine ----do	r 36	32	Mainly to Macao.
Distillate fuel oil ----do	r 399	489	All to Macao.
Residual fuel oil ----do	r 44	42	Do.
Lubricants ----do	r 178	206	Taiwan 64; Thailand 40; Indonesia 34.
Mineral jelly and wax ----do	37	54	Peru 31; Philippines 6; Bolivia 6.
Other ----do	r 2	3	Mainly to Macao.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	11	6	Mainly to Philippines.

r Revised.
[1] Less than ½ unit.

Table 4.—Hong Kong: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	905	4,540	Mainly from People's Republic of China.
Oxide and hydroxide	535	433	Japan 220; West Germany 178.
Metal including alloys, all forms	35,794	35,068	Japan 8,279; New Zealand 4,783; Ghana 4,262.
Arsenic, trioxide, pentoxide, acids	r 62	55	Mainly from People's Republic of China.
Chromium oxide and hydroxide	35	17	Japan 7; Netherlands 5; United Kingdom 2.
Cobalt oxide	50	36	Belgium-Luxembourg 18; United Kingdom 11; Australia 7.
Copper:			
Copper sulfate	75	68	All from United Kingdom.
Oxides and hydroxides	r 138	164	West Germany 132; Norway 17.
Metal including alloys, all forms	r 16,673	18,211	Japan 8,617; Taiwan 2,012.
Gold: Metal, unworked and partly worked thousand troy ounces	1,167	531	Singapore 310; United Kingdom 78.
Iron and steel:			
Scrap thousand tons	78	105	United Kingdom 44; South Vietnam 12; Belgium-Luxembourg 11.
Pig iron, ferroalloys and similar materials do	14	8	People's Republic of China 4; North Korea 2.
Steel, primary forms do	107	81	Mainly from Australia.
Semimanufactures do	524	495	Japan 274; United Kingdom 98; People's Republic of China 86.
Lead:			
Oxides, n.e.s	r 254	172	Australia 52; Netherlands 47; Spain 30.
Metal including alloys, all forms	r 4,454	1,946	South Vietnam 1,015; Canada 215.
Magnesium metal including alloys, all forms	r 300	111	United States 58; South Vietnam 30.
Manganese:			
Ore and concentrate	662	680	All from Thailand.
Oxides	2,312	13,918	Mainly from Japan.
Mercury 76-pound flasks	698	986	United Kingdom 428; Netherlands 240; People's Republic of China 232.
Nickel:			
Oxides	62	55	France 22; United Kingdom 18; Netherlands 15.
Metal including alloys, all forms	478	743	Canada 235; Finland 193; United Kingdom 114.
Platinum-group metals including alloys, all forms thousand troy ounces	211	93	West Germany 31; Australia 20; Japan 18.
Rare-earth oxides	r 5	7	United States 4; Japan 2.
Silver metal including alloys, all forms thousand troy ounces	400	823	Philippines 543; North Korea 97.
Tin metal including alloys, all forms	r 781	698	Malaysia 563; Japan 99.
Titanium:			
Ore and concentrate	203	150	All from Australia.
Oxides	4,930	3,196	Japan 689; United Kingdom 589; United States 532.
Tungsten metal including alloys, all forms	r 270	223	Japan 88; West Germany 76; United States 52.
Zinc:			
Oxides	1,024	527	Australia 129; United Kingdom 73; West Germany 72.
Metals including alloys, all forms	r 5,771	8,787	Australia 3,943; Japan 3,485; United Kingdom 918.
Other:			
Ashes and residue containing nonferrous metal	--	140	All from South Vietnam.
Oxides, hydroxides and peroxides of metal n.e.s	149	137	Taiwan 91; Japan 28.
Metals including alloys, all forms:			
Metalloids	8	39	United Kingdom 19; Japan 9; People's Republic of China 9.
Base metals including alloys, all forms	270	97	People's Republic of China 38; Japan 31; United Kingdom 16.

See footnote at end of table.

Table 4.—Hong Kong: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS			
Abrasives:			
Natural, n.e.s	1,207	550	United States 278; Taiwan 224.
Dust and powder of precious stones value	r $277	$9,680	Switzerland $5,200; Belgium-Luxembourg $3,055; Israel $1,425.
Grinding and polishing wheels and stones	468	1,031	United Kingdom 310; Japan 229.
Asbestos	67	68	People's Republic of China 51; Canada 9.
Barite and witherite	157	265	People's Republic of China 216; West Germany 39.
Boric acids	203	276	United States 208; People's Republic of China 44.
Cement, hydraulic thousand tons	1,211	1,337	People's Republic of China 443; Japan 380; Republic of Korea 335.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	r 7,648	12,174	United States, 6,427; People's Republic of China 4,891.
Products value, thousands	$15,731	$15,219	People's Republic of China $5,812; Japan $4,529.
Cryolite and chiolite	33	36	People's Republic of China 30; Denmark 6.
Diamond:			
Gem thousand carats	r 1,130	1,023	Israel 311; Belgium-Luxembourg 206; India 198.
Industrial value, thousands	$1,852	$601	Singapore $414; United Kingdom $152.
Diatomaceous earth	114	267	United States 139.
Feldspar and fluorspar	1,355	1,127	Mainly from People's Republic of China.
Fertilizer materials:			
Crude	1,070	1,095	Thailand 480; People's Republic of China 395; United States 182.
Manufactured:			
Nitrogenous	2,124	3,097	Japan 1,224; Singapore 928; India 406.
Phosphatic	359	120	United States 50; West Germany 35; Singapore 29.
Potassic	16	10	All from West Germany.
Other including mixed	9,641	5,575	West Germany 4,528; Netherlands 625.
Ammonia	r 670	628	Japan 540.
Graphite	1,650	2,359	Mainly from People's Republic of China.
Gypsum and plasters	14,857	31,571	Australia 20,260; Republic of Korea 8,398.
Lime	53,817	34,299	People's Republic of China 26,472; North Vietnam 5,525.
Magnesite	503	533	All from People's Republic of China.
Mica, all forms	185	95	India 47; United States 26; Japan 12.
Pigments, mineral including processed iron oxides	651	657	People's Republic of China 235; West Germany 194; India 115.
Precious and semiprecious stones including synthetic other than diamond value, thousands	$81,340	$58,581	Japan $12,467; Australia $6,584.
Salt	33,394	46,377	People's Republic of China 31,592; Thailand 8,214.
Sodium and potassium compounds, n.e.s	r 20,238	23,726	Singapore 11,778; Taiwan 6,114.
Stone, sand and gravel:			
Dimension stone	11,689	19,702	Italy 7,917; People's Republic of China 4,528.
Dolomite	51	--	
Gravel and crushed rock	r 19,875	83,280	Macao 73,901; People's Republic of China 9,026.
Limestone except dimension	7,762	7,312	All from People's Republic of China.
Quartz and quartzite	1,031	2,474	Mainly from People's Republic of China.
Sand, excluding metal bearing	6,546	2,212	Do.
Sulfur:			
Elemental, all forms	1,585	2,419	Singapore 1,556; France 305; Poland 278.
Sulfuric acid	487	330	United Kingdom 217; Taiwan 52; People's Republic of China 52.

See footnote at end of table.

Table 4.—Hong Kong: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Talc and related material	2,824	2,765	Mainly from People's Republic of China.
Other nonmetals, n.e.s.:			
Crude	5,236	4,560	Do.
Mineral waste	740	882	People's Republic of China 562; Thailand 246.
Oxides, hydroxides and peroxides of strontium, barium and magnesium	26	28	Taiwan 15; Japan 9.
Fluorine, bromine, iodine	1	1	Mainly from United Kingdom.
Building materials of asphalt, asbestos, and fibre materials and unfired nonmetals	11,784	12,023	United Kingdom 4,298; People's Republic of China 2,240; Singapore 1,620.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	56	320	Singapore 203; United States 93.
Carbon black and gas carbon	705	580	Japan 270; United States 115; Taiwan 96.
Coal, coke, and peat including briquets	26,813	16,146	People's Republic of China 5,745; North Vietnam 5,227; Japan 4,327.
Petroleum and refinery products:			
Gasoline, including natural thousand 42-gallon barrels	1,182	1,130	Singapore 695; Republic of Korea 211; Iran 197.
Kerosine, aviation, industrial and white spirits do	5,792	5,912	Singapore 4,193.
Diesel and distillate fuel oil do	6,638	7,340	Singapore 3,748; People's Republic of China 1,418; Republic of Korea 843.
Residual fuel oil do	20,241	20,452	Singapore 12,309; Saudi Arabia 5,171.
Lubricants do	r 353	501	Singapore 138; Japan 89; United States 88.
Mineral jelly and wax do	98	101	People's Republic of China 45; Singapore 35.
Other:			
Bitumen and other mixtures do	r 144	151	Singapore 123; Republic of Korea 20.
Liquefied petroleum gas do	r 854	890	Singapore 563; Republic of Korea 110; Thailand 109.
Pitch do	48	51	Japan 28; United Kingdom 23.
Unspecified do	r 167	20	All from Singapore.
Mineral tar and other coal-, petroleum, or gas-derived crude chemicals	r 246	118	United Kingdom 63; Japan 55.

r Revised.

LAOS [9]

Laos emerged after two decades of civil strife encumbered with economic problems, a poor transportation system, a high birthrate, and a population that was 80% dependent on agriculture for a livelihood. On December 2, 1975, the country was officially declared the People's Democratic Republic of Laos. The economy, shaken further by the 1974 cutoff of funds by the U.S. Agency for International Development, began 1975 with uncontrolled inflation that reached a rate of 40% per year by midyear. The strength of the new political regime, however, enabled the Government to initiate severe economic controls. New policies, enacted during the year, began to take effect, and the economy seemed to be stabilizing at yearend.

Both the People's Republic of China and North Vietnam were aiding in the construction of roads needed to upgrade the transportation network in this landlocked, mountainous country. An added benefit of the roadbuilding program will be easier access to areas of potential mineral development.

Projects to increase electric power generation and transmission were also under consideration. A major powerplant expansion program was scheduled for the Nam Ngum dam, and construction was to begin in early 1976. Capacity was to be raised from 30 megawatts to 110 megawatts. The plant exports most of its power to Thai-

[9] Prepared by Gordon L. Kinney.

land, thereby earning much-needed foreign exchange. The Thai Government was expected to buy most of the added power output when the plant expansion was completed. A 115-kilovolt powerline was to be installed from Nam Ngum to Phonthong, and a feeder connection would further provide transmission facilities to the southern part of Vientiane Province.

The only significant mineral production in Laos was tin. Production was mainly from mines managed by the Société d'Études et d'Exploitations Minières de l'Indochine at Phontiou, about 80 kilometers north of Thakhek. The concentration plant has a rated capacity of 1,800 tons per year of 60% tin concentrate. Total domestic production, however, was about 520 tons of tin-in-concentrate, 15% less than 1974 output. About 100 tons of this amount was possibly contributed by a small mine reported to be in the Boneng District. The estimated tin reserves in Laos were 65,000 tons (metal content) with ore grading 0.5% to 1.0% tin. However, the country's mineral resources have not been thoroughly explored, and the tin reserves could be much larger. Japanese entrepreneurs were reportedly interested in developing iron ore deposits on the Plain of Jars in Xiangkhouang Province. Lead and zinc occurrences with silver values have been discovered in several areas.

Rich potash deposits were confirmed north and east of Vientiane city. Test drillings made about 16 kilometers north of the city reportedly located a 30-meter-thick layer of interbedded sylvite and halite containing around 30% K_2O. The deposit extended over a considerable area, and reserves were thought to be around 1 million tons of ore. The same geologic formation extends across the border into Thailand where similar ore bodies have been reported. The development and exploitation of this deposit would require a large capital investment, but would also provide a major source of potash for the Asian market.

A salt mine in Kong hamlet, Vientiane Province, was expected to begin operation at yearend. It was expected to supply about 5,000 tons per year of refined salt for domestic consumption.

Coal was mined near Muang Vangviang, and a small amount was reportedly exported for the first time. Coal deposits were also known to exist in Saravane Province. Laos produced no crude oil or natural gas in 1975, and its modest needs for fuels were met by importing about 120,000 tons of petroleum products from Thailand.

MONGOLIA [10]

Total Mongolian Government expenditures in 1975 were estimated at $810 million, distributed as follows: National economy, 37%; social and cultural projects, 45%; and defense, 14%. In the 5-year economic plan (1976–80), over $1,500 million was scheduled for investment in developing industry. Most of the funding would be for developing fuel and power, extracting construction materials, and the food processing industry.

Industrial production averaged around 7% for 1970–74. In 1975, the level of industrial production was to be about 6% over the 1974 output, principally due to coal production, which is by far the largest mineral industry in Mongolia. The major coal mining areas are centered at Nalayha, Sharyn Gol, and Chuluun. Production of coal in 1975 was estimated at 2.5 million tons from 14 opencast mines. About 150 coal deposits have been discovered in Mongolia. Under the provisions of the next economic plan, new mines were scheduled for development to add 5 million tons of coal production capacity per year to the existing capacity. Additionally, a coal-fired power station was planned for construction based on projected coal output. The Nulalayha-Kapitalnaya, Sharyn Gol, and Aduun Chuluun coal mines were specifically designated for expansion.

Fluorspar production, around 302,000 tons in 1975, was from a fairly large mine at Berhin. Between 100 and 200 tons of tungsten concentrate was produced at the Burentsogt mine. Estimated output of other mineral products were as follows, in tons: Gypsum, 25,000; lime, 40,000; salt, 11,000; and cement, 175,000.

Plans were formed to reorganize the Ministry of Fuel, Power Industry, and Geology to coordinate the development of Mongolia's mineral resources. A ministry

[10] Prepared by E. Chin.

for geology and mining and a ministry for fuels and power were proposed to implement the country's industrial development. In June 1975, the Council for Mutual Economic Assistance (CMEA) approved a comprehensive plan to develop science and technology, and to organize the development of mineral resources in Mongolia, particularly nonferrous metals, coking coal, and phosphorite. Reportedly, an international team of CMEA technicians was scheduled to conduct geological surveys in northeastern Mongolia on a proposed budget of $4 million.

The U.S.S.R., which has provided most of Mongolia's aid, was planning to concentrate on the development of fluorspar, tin, and wolfram deposits. Moreover, Soviet technicians were expected to evaluate copper and molybdenum occurrences in the South Gobi Province and gold in northern Mongolia.

The Erdenet copper and molybdenum complex in Bulgan Province, under construction with Soviet aid, is Mongolia's largest industrial project. When completed, Erdenet will be a major producer of copper and molybdenum by world standards with a total output of 16 million tons of ore annually. Reportedly, work had been completed on the building-materials depot, motor road, and power lines at the site. Additionally, a railway was constructed between the complex and Darhan in Bulgan to provide access for the Erdenet copper and molybdenum project. Stripping had begun at the deposit site; 12 million cubic meters of overburden were to be removed annually to provide access to the ore. The complex was scheduled to be commissioned in 1980.

The bulk of Mongolia's trade is with the U.S.S.R. Imports of mineral commodities included coal, coke, and petroleum products. The U.S.S.R. also supplied crude oil for the small refinery at Dzuun Bayan. Other imports included semimanufactured products of iron and cement. Tungsten concentrates and metallurgical-grade fluorspar were the only significant domestically mined materials to be exported.

NEPAL [11]

Minerals play a very minor role in the Nepalese economy. During fiscal year 1974–75,[12] mineral production was valued at about $1.2 million, compared with Nepal's GDP of $1,425 million. The rate of growth of the GNP was only 2.3%, barely ahead of the over 2% rise in population.

Plans to set up a joint venture company to undertake exploitation of a lead-zinc deposit at Lari, high in the Ganesh Himal, were reported. The company as proposed would be owned 50% by the Government and citizens of Nepal and 50% by foreign companies. The foreign companies have done preliminary reconnaissance work and would provide technical expertise for the project. The deposit is located 35 miles northwest of Kathmandu at an elevation of 14,500 feet (4,420 meters) above sea level. The proposed ore concentration plant would be located at Somdang at an elevation of 10,000 feet (3,048 meters).

The deposit was not adequately explored because the extremely rough terrain allowed only a very limited amount of diamond drilling. The geologic findings, however, indicated a 12% to 13% lead-zinc content in an estimated 300,000 tons of ore. Commercial success of the operation would depend on the amount of ore confirmed by subsequent detailed drilling. Because of the physical location of the deposit, a great deal more reserve would have to be confirmed before mining of the deposit would be justified. If plans do materialize, however, this would be the first metallic ore processing plant in the country. Proceeds from the export of the concentrate would provide a significant amount of foreign exchange to the Nepalese economy.

Nepal's first cement plant began operation during 1975 and produced over 10,000 tons by end of the fiscal year. The cement was valued at more than $600,000, and while this was not a large figure by international standards, it was more than double the value of Nepal's next largest mineral commodity. Output from the new plant, capacity of which is rated at 50,000 tons per year, should meet about 25% of the domestic demand and save a considerable amount of foreign exchange spent on im-

[11] Prepared by Gordon L. Kinney.
[12] Fiscal year runs from July 17 to July 16.

ported cement. The Government of Nepal was striving for self-sufficiency in cement and has announced plans for a second plant, to be located at Hetauda, south of Kathmandu. The 260,000-ton-per-year plant was to reportedly cost at least $21 million.

Consumption of cement in Nepal during 1975 was estimated at 170,000 tons. Demand has been rising at about 10% per year.

Nepal produces virtually no mineral fuels and is dependent on imports for all of its petroleum needs. Petroleum imports at the rate of about 70,000 tons per year were supplied by the Soviet Union and Middle East countries through a swap agreement in which India took control of the incoming oil at various ports of entry and supplied an equal amount to Nepal from the refinery most convenient to the Nepal border.

SINGAPORE [13]

Singapore's GNP reached $5.6 billion[14] in 1975, a gain of 23% in current prices. Manufacturing, which encompasses mineral-related fields like petroleum refining, metal fabrication, cement, and chemicals, remained the leading component of the GNP. However, manufacturing output, measured in terms of value added, decreased to $1.4 billion, compared with $1.5 billion in 1974. Approximately 17% of the value added in 1975 was attributed to petroleum refining. The major contribution to the slowdown in growth of the manufacturing sector was the downturn in the oil refining industry due to decreased demand and loss of the Vietnamese market. Oil rig construction and industries related to shipbuilding and repair fared reasonably well on account of past orders. The shipbuilding and repair industry increased its turnover by 13% to $251 million. Singapore is the world's fourth largest port, and its oil rig construction was ranked as the third largest in the world.

Entrepôt trade continued to represent the lifeblood of Singapore's economy. For the first time, the United States was Singapore's largest trading partner in 1975. Imports from the United States consisted primarily of lift cranes, compressors, power generators, marine diesel engines, and iron pipe and fittings. Exports to the United States declined by about 16%, however, owing primarily to the reduced level of demand for consumer goods. Other major trading partners in 1975 were Malaysia, Japan, and the member countries of the European Economic Community.

Despite a record trade deficit of $2.7 billion during 1975, Singapore added $320 million to its foreign exchange reserves, which totaled over $3.2 billion at yearend. The surplus resulted from invisible earnings from tourism and from the financial sector, long-term capital inflows, and a large positive errors-and-omission item (reflecting a favorable balance of trade with Indonesia). While Indonesia ranks high as a trade partner, Singapore-Indonesian trade data are not available.

PRODUCTION

Singapore's production of refined petroleum products was valued at $1.8 billion in 1975, compared with $2.4 billion in 1974.[15] Production of residual fuel oil was first in quantity of output, followed by distillate fuel oil, jet fuel, gasoline, kerosine, and lubricants, in that order. Sulfur, recovered as a byproduct of oil refining, was around 6,000 tons in 1975. The sluggishness in petroleum refining was attributed to a slackening in demand in the major consuming markets and to the loss of the Vietnamese market early in 1975. Hence, local refineries, which have a potential throughput of close to 1 million barrels per day, at times operated at less than 50% of capacity.

Production of steel ingot remained around 240,000 tons as in 1974. Construction was brisk owing to expanded expenditures by the public sector on housing projects and infrastructure, including utilities and port development. Activity in this sector sustained cement production, which was more than 1 million tons for the 5th year in a row. Output of stone (broken

[13] Prepared by E. Chin.

[14] Where necessary, 1975 values have been converted from Singapore dollars (S$) to U.S. dollars at the rate of S$2.39=US$1.00. In 1974, the average exchange rate was S$2.31=US$1.00.

[15] Monthly Digest of Statistics (Singapore). V. 15, No. 9, September 1976.

granite) exceeded 2.3 million cubic meters in 1975, compared with the 1.8-million-cubic-meter level of 1973–74. The country's mineral production statistics are shown in table 1.

TRADE

Total trade in 1975 was $13.3 billion, down 7% from that of 1974. Imports totaled $8.0 billion, while exports were $5.3 million. For the first time, the United States was Singapore's largest trading partner, notwithstanding an overall decline of 3% from the trade level in 1974. Singapore's external trade by major destination in 1975 was as follows: United States, 15.0%; Malaysia, 13.8%; Japan, 13.6%; United Kingdom, 4.7%; Hong Kong, 4.3%; Australia, 4.1%; West Germany, 3.5%; and other, 41%. (Data relating to Singapore-Indonesian trade are not available.)

The major mineral-related imports by value and by commodity group were as follows, in million dollars: Crude petroleum, 1,499; petroleum products, 472; crude rubber, 311; and wrought steel shapes, 217. Over 75% of Singapore's imports of crude petroleum was high-sulfur crude oil, mainly from Kuwait, Saudi Arabia, and Iran. Most of the locally produced refined oil products and the imported refined materials were exported, primarily to other Asian countries, or sold for bunkering. Singapore's most noted export was refined petroleum products, valued at $1.4 billion in 1975.

Table 5.—Singapore: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Bauxite and concentrate	320	1,030	Taiwan 900; United States 130.
Oxide and hydroxide	1,781	962	Mainly to Malaysia.
Metal including alloys, all forms	r 1,465	3,190	Malaysia 1,483; People's Republic of China 748.
Chromium oxide and hydroxide	17	28	Mainly to Malaysia.
Cobalt oxide and hydroxide	1	(1)	All to Malaysia.
Copper metal including alloys, all forms	1,758	1,408	Malaysia 1,298; Hong Kong 102.
Iron and steel:			
Ore and concentrate	10,630	--	
Roasted pyrite	--	1	All to Malaysia.
Metal:			
Scrap	1,070	1,945	Taiwan 732; Republic of Korea 576; Netherlands 429.
Pig iron, ferroalloys, and similar materials	3,158	7,685	Malaysia 3,824; Pakistan 2,000.
Steel, primary forms	7,122	15,676	Malaysia 9,074; Bangladesh 6,328.
Semimanufactures:			
Bars, rods, angles, shapes, sections	r 43,133	65,099	Malaysia 48,700.
Universals, plates, sheets	68,539	82,904	Malaysia 62,116; United States 11,702.
Hoop and strip	1,905	1,949	Mainly to Malaysia.
Rails and accessories	8,802	6,126	Do.
Wire	4,558	3,378	Malaysia 2,161; Zambia 500.
Tubes, pipes, fittings	22,463	44,599	Brunei 17,958; Malaysia 7,858.
Castings and forgings, rough	326	680	Malaysia 208; Japan 194.
Total	r 149,726	204,735	
Lead:			
Ore and concentrate	--	2	All to India.
Oxides	21	19	Mainly to Malaysia.
Metal including alloys, all forms	r 730	1,073	Malaysia 552; Netherlands 100.
Manganese:			
Ore and concentrate	2,320	2,404	Malaysia 1,179; Kenya 399.
Oxides	150	44	All to Malaysia.
Mercury ______76-pound flasks	592	17	Mainly to Malaysia.
Nickel metal including alloys, all forms	34	44	Do.
Platinum-group metals and silver:			
Waste and sweepings ____kilograms	r 17,214	25,690	Mainly to United Kingdom.
Metals including alloys:			
Platinum group ____troy ounces	450	108,026	Do.
Silver ____thousand troy ounces	766	308	United Kingdom 200; Taiwan 100.
Tin:			
Ore and concentrate	2,841	1,629	Brazil 669; Spain 517; Mexico 351.
Metal including alloys, all forms	r 697	661	Taiwan 192; Malaysia 136; Hong Kong 105.

See footnotes at end of table.

Table 5.—Singapore: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS—Continued			
Titanium:			
Ore and concentrate	50	--	
Oxides	917	537	Mainly to Malaysia.
Tungsten ore and concentrate	565	80	North Korea 50; Netherlands 20; West Germany 10.
Zinc:			
Ore and concentrate	65	100	All to West Germany.
Oxides and peroxides (except hydroxide)	47	17	Malaysia 9; Sri Lanka 7.
Metal including alloys, all forms	5,555	3,702	Malaysia 1,483; Japan 950.
Other:			
Ore and concentrate of base metals, (excluding iron and magnesium) n.e.s	r 243	104	Brazil 54; Belgium-Luxembourg 37.
Ash and residue containing nonferrous metals	2,222	7,014	Oman 3,654; Malaysia 1,546; Hong Kong 1,150.
Oxides, hydroxides and peroxides of metals n.e.s	80	51	Malaysia 42; Thailand 8.
Metals including alloys, all forms:			
Scrap, nonferrous	12,538	7,443	Republic of Korea 2,114; Japan 1,975.
Metalloids	r 22	18	South Vietnam 10; Malaysia 8.
Alkali, alkaline earth, and rare-earth metals	4	11	Mainly to Malaysia.
Base metals, including alloys, all forms n.e.s	206	88	Do.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	194	94	Do.
Grinding and polishing wheels and stones	180	285	Do.
Asbestos	182	3,150	Malaysia 2,298; South Vietnam 799.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Kaolin	868	244	Philippines 150; Taiwan 50; Malaysia 23.
Other	6,382	5,715	Malaysia 1,418; Philippines 925; Thailand 633.
Products:			
Refractory (including nonclay brick)	1,098	749	Mainly to Malaysia.
Nonrefractory [2]	5,137	6,075	Malaysia 4,399; Netherlands 935.
Diamond:			
Gem, not set or strung value, thousands	$2,042	$2,331	Hong Kong $1,810.
Industrial do	r $744	$455	All to Hong Kong.
Feldspar and fluorspar	r 5,047	4,366	Mainly to Malaysia.
Fertilizer materials:			
Crude:			
Nitrogenous	17	--	
Phosphatic	24,530	17,959	Mainly to Malaysia.
Manufactured:			
Nitrogenous	80,260	28,808	Do.
Phosphatic	40,658	11,166	Malaysia 7,985; Thailand 2,012.
Potassic	125,566	182,968	Mainly to Malaysia.
Other including mixed	44,260	113,636	Do.
Ammonia	335	469	Do.
Graphite, natural	9	55	Philippines 40; Malaysia 15.
Gypsum and plasters	r 533	815	Malaysia 364; South Vietnam 250; Taiwan 105.
Lime	3,713	3,813	Malaysia 2,702; Brunei 1,087.
Magnesite	r 41	81	All to Malaysia.
Mica, all forms	r 83	105	Papua New Guinea 45; Australia 23; Thailand 19.
Pigments, mineral:			
Natural, crude	84	774	All to Malaysia.
Iron oxides, processed	381	364	Mainly to Malaysia.
Precious and semiprecious stones, including synthetic except diamond value, thousands	r $931	$1,177	Hong Kong $882; United States $111.

See footnotes at end of table.

Table 5.—Singapore: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
NONMETALS—Continued			
Salt	14,402	12,153	Malaysia 6,557; Brunei 4,921.
Sodium and potassium compounds, n.e.s	r 2,784	4,331	Mainly to Malaysia.
Stone, sand and gravel:			
Dimension stone	r 234	571	Do.
Dolomite, chiefly refractory grade	3	16	All to Malaysia.
Gravel and crushed rock	19,862	9,435	Mainly to Brunei.
Limestone	254	416	Malaysia 345; Brunei 71.
Quartz and quartzite	5	(1)	All to Malaysia.
Sand, excluding metal bearing	1,767	3,413	Iran 1,500; Malaysia 961; Hong Kong 600.
Sulfur:			
Elemental:			
Other than colloidal	12,912	18,223	Malaysia 17,233.
Colloidal	3,546	8,036	Thailand 4,511; Hong Kong 1,740.
Sulfur dioxide	3	2	All to Malaysia.
Sulfuric acid	1,714	1,014	Malaysia 540; Sri Lanka 425.
Talc, steatite, soapstone, pyrophyllite	1,563	1,150	Mainly to Malaysia.
Other nonmetals, n.e.s.:			
Crude	r 47,790	70,832	Brunei 19,850; Malaysia 18,544; Taiwan 13,280.
Slag, dross and similar waste, not metal bearing	20	112	Mainly to Malaysia.
Oxides and hydroxides of magnesium, strontium, barium	1	2	Do.
Bromine iodine, fluorine ... value	r $5,668	$1,289	Do.
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals, n.e.s	8,965	7,822	Hong Kong 2,289; Bangladesh 2,093.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1	47	All to Malaysia.
Carbon black	1,849	2,076	Mainly to Malaysia.
Coal, all grades, including briquets	284	4,134	Mainly to Sri Lanka.
Coke	2,270	2,610	Mainly to Malaysia.
Hydrogen, helium and rare gases ... value, thousands	r $112	$213	Malaysia $134; Taiwan $21.
Petroleum:			
Crude and partly refined ... 42-gallon barrels	158,885	72,550	All to Malaysia.
Refinery products: [3]			
Gasoline:			
Aviation ... thousand 42-gallon barrels	1,946	1,634	South Vietnam 670; Australia 238; Thailand 179.
Motor ... do	17,959	7,676	South Vietnam 2,355; Malaysia 1,909.
Kerosine and jet fuel ... do	24,065	17,216	United States 5,423; Hong Kong 3,640.
Distillate fuel oil ... do	23,945	27,550	South Vietnam 6,178; Malaysia 5,663; Hong Kong 3,366.
Residual fuel oil ... do	46,993	46,456	Japan 17,219; Hong Kong 11,256; Australia 7,045.
Lubricants ... do	r 25	327	Malaysia 69; Thailand 64; Philippines 36.
Mineral jelly and wax ... do	r 393	458	Brazil 65; Taiwan 48; Japan 40.
Other:			
Nonlubricating oils, n.e.s ... do	r 17	19	Mainly to Malaysia.
Pitch and petroleum coke ... do	4	3	Do.
Bitumen and bituminous mixtures, n.e.s ... do	1,283	1,140	Australia 442; South Vietnam 245.
Other ... do	r 4,221	13,277	Japan 8,893; Thailand 1,457; South Vietnam 1,398.
Total ... do	r 120,851	115,756	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ... thousand tons [4]	r 725	1,481	Japan 832; New Zealand 256.

r Revised.

[1] Less than 1/2 unit.

[2] Total excludes bricks of baked clay valued at $23,389 in 1973 and $32,218 in 1974.

[3] In addition to the products listed, liquefied petroleum gas valued at $4,350,062 in 1973 and $15,022,948 in 1974 was exported.

[4] Excluded from this total are benzol and creosote oil.

Table 6.—Singapore: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum:			
Bauxite and concentrate	301	3,528	Malaysia 2,323; People's Republic of China 1,200.
Oxide and hydroxide	[r] 9,255	4,207	Japan 2,770; People's Republic of China 600.
Metal including alloys, all forms	14,635	16,709	United States 2,595; Ghana 2,077.
Chromium oxide and hydroxide	78	103	West Germany 58; United Kingdom 14.
Cobalt oxide and hydroxide	[r] 1	3	United Kingdom 2; West Germany 1.
Copper:			
Metal including alloys, all forms	8,749	9,523	Japan 3,446; Australia 2,083.
Iron and steel:			
Ore and concentrate	50,517	10,134	Mainly from Malaysia.
Metal:			
Scrap	61,591	33,099	Mainly from Australia.
Pig iron including cast iron	31,713	26,261	India 15,500; Australia 5,090.
Sponge iron, powder and shot	186	343	Japan 188; India 66; Australia 42.
Ferroalloys:			
Ferromanganese	2,990	2,520	India 1,860; Japan 524.
Other	3,090	2,023	Mainly from Japan.
Steel, primary forms	39,931	38,052	United States 12,637; North Korea 9,900; Japan 9,253.
Semimanufactures:			
Bars, rods, angles, shapes, sections	341,896	364,085	Mainly from Japan.
Universal, plates, sheets	415,371	574,265	Do.
Hoop and strip	25,894	33,463	Do.
Rails and accessories	26,200	10,500	Malaysia 2,176; Belgium-Luxembourg 2,025; France 1,539.
Wire	33,742	17,546	Japan 7,427; People's Republic of China 5,607.
Tubes, pipes, fittings	116,745	310,325	Japan 199,666; United States 71,218.
Castings and forgings, rough	2,032	2,903	Japan 1,076; Malaysia 715.
Total	961,880	1,313,087	
Lead:			
Ore and concentrate	3	4	France 3; Germany 1.
Oxides	558	458	Australia 297.
Metal:			
Unwrought	[1] 3,031	3,524	Australia 2,490; Thailand 434.
Semimanufactures	[1] 231	254	Australia 147; Japan 43; Netherlands 31.
Manganese:			
Ore and concentrate	16,222	4,932	Mainly from Ghana.
Oxides	950	813	India 556; Japan 180.
Metal, unwrought	(2)	--	
Mercury ... 76-pound flasks	[r] 167	331	Italy 109; Spain 100; West Germany 70.
Nickel metal including alloys, all forms	151	283	United States 94; Australia 51; United Kingdom 49.
Platinum-group metal and silver:			
Metals including alloys:			
Platinum group ... troy ounces	[r] 1,157	354	United States 129; United Kingdom 96; Japan 64.
Silver ... do	467,761	548,587	Australia 169,434; Japan 158,246; United States 69,896.
Tin:			
Ore and concentrate	134	23	All from Malaysia.
Oxides	(3)	(3)	Mainly from Italy.
Metal including alloys, all forms	[r] 1,136	1,088	Malaysia 654; United States 124; United Kingdom 115.
Titanium:			
Ore and concentrate:			
Ilmenite	142	--	
Other	301	144	All from Australia.
Oxides	3,547	2,690	Japan 1,021; Australia 661; United States 394.
Tungsten ore and concentrate	478	71	All from Thailand.
Zinc:			
Ore and concentrate	(3)	(3)	All from United Kingdom.
Oxides and peroxides, except hydroxides	844	888	People's Republic of China 257; Australia 187; United Kingdom 176.
Metal including alloys, all forms	[r] 11,876	11,991	Canada 4,828; Japan 3,433; North Korea 1,707.

See footnotes at end of table.

Table 6.—Singapore: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS—Continued			
Zircon	96	126	Australia 100; Japan 22.
Other:			
Ore and concentrate of base metals, excluding iron and magnesium	358	87	Burma 55; Thailand 23.
Ash and residue containing nonferrous metals	r 14,961	18,597	Mainly from Australia.
Oxides, hydroxides, and peroxides of metals, n.e.s	218	290	West Germany 63; Sweden 40; Norway 37.
Metals including alloys, all forms:			
Scrap, nonferrous	17,876	15,581	Mainly from Malaysia.
Metalloids	5	14	West Germany 8; United Kingdom 2; Malaysia 2.
Alkali, alkaline earth, and rare-earth metals	17	19	Japan 10; United Kingdom 6; United States 3.
Pyrophoric alloys	125	130	Austria 72; Japan 23; West Germany 19.
Base metals including alloys	r 1,631	115	United States 45; Taiwan 20; Japan 16.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	163	188	United States 43; Malaysia 35; Italy 31.
Dust and powder of precious and semi-precious stones value	r $9,061	$6,447	Mainly from Japan.
Grinding and polishing wheels and stones	541	792	Japan 288; Malaysia 81; India 79.
Asbestos	3,155	10,701	Canada 3,631.
Cement thousand tons	r 1,182	1,187	Japan 418; Republic of Korea 393; Australia 118.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Kaolin	3,936	4,171	Malaysia 3,106; Thailand 500.
Other	23,791	44,027	Mainly from United States.
Products:			
Refractory (including nonclay brick)	9,371	12,256	Austria 3,150; United Kingdom 2,723; People's Republic of China 2,224.
Nonrefractory [4]	r 50,639	48,571	Japan 11,595; Malaysia 6,927; Italy 5,498.
Diamond:			
Gem, not set or strung value, thousands	r $6,316	$10,297	India $4,135; Hong Kong $2,548; Belgium-Luxembourg $2,097.
Industrial value	r $362,976	$17,762	Australia $12,907; United States $2,503.
Diatomite and other infusorial earth	422	490	United States 306; Japan 152.
Feldspar and fluorspar	6,439	6,016	India 4,857; United Kingdom 728.
Fertilizer materials:			
Crude:			
Nitrogenous	30	--	
Phosphatic	28,423	20,802	Mainly from Christmas Island.
Manufactured:			
Nitrogenous	111,581	67,322	Japan 17,252; West Germany 13,913; United Kingdom 13,842.
Phosphatic	114,891	46,133	United States 26,348; Netherlands 14,835; Morocco 4,800.
Potassic	145,386	226,279	Canada 102,555; Israel 63,996.
Other including mixed	46,365	94,829	West Germany 27,419; United States 25,620; Netherlands 24,429.
Ammonia	410	608	Malaysia 258; South Vietnam 200.
Graphite, natural	272	199	People's Republic of China 94; Republic of Korea 40; United Kingdom 20.
Gypsum and plasters	40,773	25,226	Australia 14,817; Japan 8,462.
Lime	4,192	8,631	Malaysia 5,672; United Kingdom 2,044; People's Republic of China 905.

See footnotes at end of table.

Table 6.—Singapore: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
NONMETALS—Continued			
Magnesite	3,847	409	Austria 253; North Korea 100.
Mica, all forms	657	2,258	Mainly from United States.
Pigments, mineral:			
Natural, crude	113	212	Japan 72; People's Republic of China 50; United Kingdom 49.
Iron oxides, processed	1,412	1,979	People's Republic of China 1,140; West Germany 519; India 120.
Precious and semiprecious stones, except diamond, worked and unworked:			
Natural ____value, thousands	r $4,642	$3,804	Hong Kong $2,042; People's Republic of China $697; Sri Lanka $438.
Manufactured ____do	r $60	$110	Thailand $26; Brazil $23; India $18.
Salt and brine	43,072	55,192	Thailand 28,446; West Germany 11,825; India 9,506.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	9,847	16,638	West Germany 4,148; United States 3,031; Japan 2,504.
Caustic potash, sodic and potassic peroxides	556	554	Belgium-Luxembourg 273; Hong Kong 134; West Germany 62.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	21,786	18,563	Mainly from Malaysia.
Worked	8,550	9,666	Italy 5,328; People's Republic of China 3,110.
Dolomite, chiefly refractory grade	3,211	2,110	Mainly from Malaysia.
Gravel and crushed rock	r 502,683	461,340	Do.
Limestone (except dimension)	32,643	26,851	Do.
Quartz and quartzite	209	178	United States 147; West Germany 22.
Sand, excluding metal bearing	114,168	34,805	Mainly from Malaysia.
Sulfur:			
Elemental:			
Other than colloidal	5,832	2,861	Mainly from Japan.
Colloidal	7,801	3,414	Mainly from Canada.
Sulfur dioxide	7	3	Mainly from United Kingdom.
Sulfuric acid	63	100	Malaysia 34; Israel 20; Japan 20.
Talc, steatite, soapstone, pyrophyllite	r 12,794	9,192	People's Republic of China 7,085; Republic of Korea 1,107.
Other nonmetals, n.e.s.:			
Crude	112,415	146,147	Thailand 84,905; India 31,252; West Germany 17,394.
Slag, dross and similar waste, not metal bearing	368	3,036	Taiwan 2,000.
Oxides and hydroxides of magnesium, strontium and barium	70	46	West Germany 25; People's Republic of China 12; Japan 6.
Bromine, iodine, fluorine__value	r $3,719	$6,035	United Kingdom $2,724; West Germany $1,078; France $795.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	11,791	12,400	Malaysia 8,855; Thailand 3,255.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	194	15	All from United States.
Carbon black	5,697	7,307	United States 2,351; Japan 2,140.
Coal, all grades, including briquets	1,286	2,671	Mainly from United States.
Coke	8,473	10,472	Mainly from Japan.
Hydrogen, helium and rare gases value, thousands	r $408	$662	United States $463; Australia $88: United Kingdom $66.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	r 160,115	169,260	Kuwait 51,307; Saudi Arabia 46,511; Iran 38,753.
Refinery products:			
Gasoline:			
Aviation ____do	2,038	1,612	Iran 1,405; Sri Lanka 145.
Motor ____do	3,244	1,425	Iran 634; Bahrain 533; Kuwait 195.

See footnotes at end of table.

Table 6.—Singapore: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Kerosine thousand 42-gallon barrels	3,034	1,600	Malaysia 1,008; Italy 221.
Jet fuel do	4,079	966	People's Democratic Republic of Yemen 214; Italy 186; Kuwait 161.
Distillate fuel oil do	5,950	3,009	Saudi Arabia 938; Bahrain 754; Kuwait 376.
Residual fuel oil do	28,191	20,110	Bahrain 4,717; Malaysia 3,969; Saudi Arabia 2,964.
Lubricants do	678	129	Japan 22; Netherlands Antilles 21; Malaysia 15.
Mineral jelly and wax do	43	59	People's Republic of China 33; Burma 17.
Other:[5]			
Nonlubricating oils, n.e.s do	r 23	32	United States 9; Malaysia 8; France 5.
Pitch and petroleum coke do	14	17	United States 14; Australia 2.
Bitumen and bituminous mixtures n.e.s do	19	32	United States 14; Malaysia 7; United Kingdom 5.
Other do	r 1,178	1,755	Malaysia 525; India 278; Iran 235.
Total do	r 48,491	30,746	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals[6]	r 69,482	327,615	Mainly from Malaysia.

r Revised.
[1] Erroneously reported as manganese metal in 1974 edition.
[2] Revised to none.
[3] Less than ½ unit.
[4] Total excludes bricks of baked clay valued at $644,946 in 1973 and $943,914 in 1974.
[5] In addition to the products listed, liquefied petroleum gas valued at $126,996 in 1973 and $255,194 in 1974 was imported.
[6] Creosote oil is excluded from this total.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—The National Iron & Steel Mills, Ltd. (NISM), and Malaysia Iron & Steel Mills, Ltd. were the only two steel producers of any consequence in Singapore. NISM, the larger of the two companies, has the capacity to produce more than 200,000 tons of steel products annually at its plant in Jurong. However, total industry output of steel products was only about 240,000 tons, with an estimated value of $59 million.

Nonmetals.—*Cement.*—Three companies, Asian Cement (Malaysia), Ltd., Singapore Cement Manufacturing Co., Ltd., and Parr Malaysia Cement Works, Ltd., comprise the cement industry of Singapore. All the producers were actually grinding operations and relied on imports of clinker. Total output of cement was around 1.1 million tons valued at $72 million. The value added on Singapore's output of finished cement was $20 million in 1975, compared with $14 million in 1974.

Mineral Fuels.—*Petroleum.*—At yearend 1975, Singapore's total crude refinery capacity per day totaled 922,650 barrels, distributed as follows in barrels per day: BP Refinery Singapore Pte., Ltd., 25,650; Esso Singapore Pte., Ltd. (Esso), 192,000; Mobil Oil Singapore Pte., Ltd., 175,000; Shell Eastern Petroleum, Ltd. (Shell), 460,000; and Singapore Petroleum Co., Pte., Ltd., 70,000. Expansion of the Shell refinery at Prilau Bukom to 530,000 barrels per day was expected to be completed in early 1976, making this operation the second largest in the world. Esso was completing the expansion of its plant at Palau Ayer Chawan to 231,000 barrels per day. In addition, total downstream refining capacity at this plant was as follows, in barrels per day: Catalytic reforming, 20,000; catalytic hydrotreating, 206,000; catalytic hydrodesulfurization, 96,000; vacuum distillation, 80,000; lube manufacture, 5,000; and asphalt, 5,200.

Two Japanese companies, Maruzen Oil Company, Limited, and Daikyo Oil Co., Ltd., were considering a joint venture to build a 120,000-barrel-per-day refinery on Padang Island. Construction of the $833 million petrochemical project of Japan's Sumitomo Chemical Co., Ltd. was delayed for 1 or 2 years. Rather than financial difficulties, the major potential obstacle for the petrochemical project was severe competition from the introduction of excess supplies in the Asian market by other petrochemical producers.

SRI LANKA [16]

Mineral production again showed a mixture of ups and downs for the various commodities. Gems constituted the major foreign exchange earner in the mineral sector, with output value increasing more than 60%, to $22.6 million in 1975. Exports were up nearly 40% to $21.8 million. Demand for Sri Lankan gems continued high from Switzerland and Hong Kong, the two largest buyers in recent years. Sapphires and rubies went mainly to Western countries, while alexandrites, cat's eye, and star stones went mainly to Japan.

A lapidary center was setup in 1975 by the Government-owned State Gem Corporation (SGC) with the intention of improving the standards of workmanship of the local gem cutters. However, the expected profits from the SGC purchases and sales did not materialize, and it was reported that the company's stock of gems had a market value far below the actual cost to the company. A Government commission was appointed to look into the situation.

Production increases were also recorded for feldspar, graphite, zircon, and clays (for the brick and tile industry). Rutile, massive quartz, and salt production remained stable. Cement and ilmenite recorded drops of 23% and 21% from the 1974 production of 474,000 tons and 81,000 tons, respectively. China clay, dolomite, limestone, and mica also showed production decreases for 1975.

The severe inflation suffered by Sri Lanka in 1974 continued unabated in 1975. Industrial development was slowed, and real income was adversely affected. The cost of living index hit a new high in July 1975. The balance of payments deficit stood at nearly $100 million for the first 6 months of 1975. The deficit for the whole year may reach $200 million, brought about mainly by commodity price increases, especially in imported food and raw materials. High world prices for traditional exports failed to offset the increased costs of imports, because domestic production of tea and rubber had declined significantly.

Production at three major graphite mines, Bogala, Kahatagaha, and Kolongaha, continued satisfactorily. It was reported that development work began on the new Rangala graphite mine in Yatiyantota District. Work continued on a graphite flotation plant, expected to be completed by mid-1976. Graphite sales to the United States in 1975 totaled about 1,400 tons, valued at nearly $500,000.

It was reported that the People's Republic of China had offered to help design and construct a large flat-glass factory using local raw materials. The plant would be the first in Sri Lanka and would cost over $8 million.

Apparently, the Chinese had also offered to help build a phosphate fertilizer plant. This plant would process the apatite discovered near Eppawala in Anuradhapura District by the Sri Lanka Geological Department in 1974. Kellogg Overseas, a subsidiary of Pullman Kellogg Co., has contracted to build the 300,000-ton-per-year Sapugaskanda urea fertilizer plant, and construction could begin in early 1976. This will be the first urea fertilizer plant in the country, and should help eliminate fertilizer imports and increase agricultural production in the process. Planned completion of the project is 1979. Expansion of the Sapugaskanda oil refinery from 38,000 barrels per day to over 50,000 barrels per day, which began in 1975, was scheduled for completion in 1977. The urea fertilizer plant located nearby is to use naphtha feedstock from this refinery.

Sri Lanka continued to be totally dependent on foreign sources for its crude oil supplies. Imports in 1975 were nearly 1.5 million tons valued at over $100 million. To facilitate unloading of crude imports, the port of Colombo has reportedly begun construction of a new anchorage to accommodate 60,000-ton tankers. Present facilities are limited to 36,000-ton ships.

Development of offshore petroleum potential is moving ahead rapidly. Twelve offshore exploration blocks have been outlined

[16] Prepared by Gordon L. Kinney.

by the Government. The first 10 blocks nearly surround the island and extend out to the 100-fathom line. Blocks 11 and 12 are deep-water sections farther offshore. One unnumbered area in the northwest near Mannar Island has been reserved for the State-owned Ceylon Petroleum Corporation. The first offshore exploratory well is to be drilled in the unnumbered area in 1976. Production-sharing contracts will be offered for the other 12 blocks. Main terms offered for the contracts are that all expenses are born by the prospector with costs being repaid from the first 30% of commercial production. Thereafter, the remaining production will be split 80–20 in favor of Sri Lanka.

Table 7.—Sri Lanka: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1974
METALS	
Copper metal including alloys, all forms ... value	$409
Iron and steel metal including alloys, all forms	713
Lead metal including alloys, all forms	192
Silver metal including alloys ... value	$604
Other, ores and concentrates	81,197
NONMETALS	
Abrasives, natural ... value	$7
Cement	53,088
Clays, crude ... value	$485
Fertilizer materials, crude and manufactured	5
Graphite	9,448
Mica including splittings and waste	180
Precious and semiprecious stones unspecified ... carats	682,382
Salt	97
Stone and sand (excluding metal bearing sand)	5
Sulfur, sulfuric acid and sulfur dioxide ... value	$118
Other nonmetals, n.e.s ... do	$9
MINERAL FUELS AND RELATED MATERIALS	
Hydrogen, oxygen and rare gases	(1)
Petroleum refinery products:	
Nonbunkers, all types ... thousand 42-gallon barrels	112
Bunkers:	
Jet fuel ... do	383
Distillate fuel oil ... do	439
Residual fuel oil ... do	2,301
Lubricants ... do	2
Total ... do	[2] 3,237
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	58,265

[1] Less than ½ unit.
[2] Excludes an unspecified quantity valued at $563,667.

Table 8.—Sri Lanka: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1974
METALS	
Aluminum metal including alloys, all forms	1,608
Arsenic trioxide, pentoxide, acid ____value__	$274
Copper metal including alloys, all forms	761
Iron and steel, metal:	
Scrap	20
Pig iron, ferroalloys, similar materials	213
Steel, primary forms	35,894
Semimanufactures	22,577
Lead metal including alloys, all forms	575
Manganese oxides	118
Mercury ____76-pound flasks__	15
Nickel metal including alloys, all forms	6
Silver metal including alloys ____troy ounces__	1,167
Tin metal including alloys, all forms	318
Titanium oxides	142
Tungsten metal including alloys, all forms	305
Zinc:	
Oxides	362
Metal including alloys, all forms	210
Other:	
Ore and concentrate	792
Oxides, hydroxides, peroxides of metals, n.e.s	22
Metal:	
Alkali, alkaline-earth and rare-earth metals ____value__	$211
Pyrophoric alloys ____do____	$19
Base metals including alloys, all forms, n.e.s	10
NONMETALS	
Abrasives, natural	66
Asbestos	2,547
Barite and witherite	25
Boron materials, oxide and acid	14
Cement	102
Chalk	22
Clays and clay products (including all refractory brick):	
Crude clays, n.e.s	2,284
Products:	
Refractory	1,522
Nonrefractory	789
Diamond, gem ____carats__	8
Diatomite and other infusorial earth	14
Feldspar and fluorspar	10
Fertilizer materials:	
Manufactured:	
Nitrogenous	139,332
Phosphatic	50,752
Potassic	25,598
Mixed	4,400
Ammonia	127
Gypsum and plasters	11,201
Lime	41
Magnesite	37
Mica, all grades	25
Pigments, mineral including processed iron oxides	404
Precious and semiprecious stones, excluding diamond ____carats__	37
Salt	115
Sodium and potassium compounds:	
Caustic soda	3,993
Caustic potash	42
Stone:	
Dimension stone, worked	37
Dolomite	2
Sulfur:	
Elemental:	
Other than colloidal	1,019
Colloidal	197
Sulfuric acid	373
Talc, steatite, soapstone, pyrophyllite	1,080
Other nonmetals, n.e.s.:	
Crude	2,446
Oxides and hydroxides of magnesium, strontium, barium	12
MINERAL FUELS AND RELATED MATERIALS	
Asphalt and bitumen, natural	27
Carbon black	1,335
Coal, all types including briquets	4,146

Table 8.—Sri Lanka: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1974
MINERAL FUELS AND RELATED MATERIALS—Continued	
Coke	2,400
Hydrogen, helium, rare gases	4
Petroleum and petroleum refinery products:	
Crude and partly refined ... thousand 42-gallon barrels	11,246
Refinery products:	
Gasoline ... do	5
Kerosine and jet fuel ... do	168
Distillate fuel oil ... do	139
Lubricants ... do	6
Other:	
Liquefied petroleum gas ... do	(1)
Unspecified ... do	83
Total ... do	401
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	672

[1] Less than ½ unit.

NORTH VIETNAM [17]

Warfare ceased in April 1975, and rehabilitation of bomb-damaged industrial facilities was nearly completed by yearend. Gross output value for central industries during the year was 34% higher than in 1974. Reconstruction and expansion of the electric power system were stressed because the Government realized that major improvements in the power system were necessary in order to restore the economy to a satisfactory level. Particular emphasis was to be paid to the power distribution system. Two major powerplants, Uong Bi and Ninh Binh, were returned to partial operation. Reconstruction of powerplants in Cao Ngan and Viet Tri was progressing satisfactorily, and plans were being laid for new thermal stations in Pha Lai and Dap Cau. It was reported that two-thirds of the electric power requirement in the country was generated by thermal powerplants fueled by locally produced coal. Electric power output was up nearly 30% over that of 1974.

Data on the country's mineral industry are difficult to obtain and seldom given in specific quantities. The few figures that are available are often couched in terms of percent increase over an indefinite base period. According to various sources, at least some production was reported in 1975 for coal, iron ore, chromite, apatite, tin, zinc, cement, gypsum, salt, antimony, and several nonmetallic construction materials.

COMMODITY REVIEW

Metals.—The Vietnamese were apparently constructing a small antimony-processing plant which would utilize locally mined ore. They were planning to begin production in the second quarter of 1976. The plant was to be the first of its kind in the country.

The Co Dinh chromite mine in Thanh Hao Province was operating during 1975. No reliable details were available on production rate or grade of ore.

It was reported that the Thai Nguyen Iron and Steel Works was operating all of its furnaces satisfactorily and that the capacity of the rebuilt plant was now 200,000 tons of ingot per year. It is questionable, however, whether the plant attained its rated capacity. No production figures are available for the iron ore mine at Trai Cau, the supplier for the Thai Nguyen plant. The rolling mill at Gia Sang was recommissioned in September 1975. The plant produces plates and rods, which were not produced domestically during the hostilities.

Tin continues to be mined at Cao Bang. Mine production was believed to be little changed at about 250 tons.

Zinc ore production continued at Cho Dien for smelting at Quang Yen.

Nonmetals.—Cement production was believed to have increased a small amount to

[17] Prepared by Gordon L. Kinney.

over 650,000 tons, but apparently this was not enough to meet the Government-planned production increase for 1975. The Haiphong cement plant continued as the Nation's largest producer but probably did not reach its prewar output level. Cement was therefore the only product in the mineral sector whose output had not surpassed prewar levels. Plans call for an over 20% increase in cement output in 1976 and the start of construction of a new cement plant at Binh Son and Phu Xuan.

Brick production was estimated at over 1,700 million with a rather ambitious increase of over 32% planned for 1976.

Fertilizer production has received a high priority since the end of the war, and projects are planned, underway, or recently completed that will greatly increase both the capacity and the variety of fertilizers produced. All planned production norms were reportedly met by the apatite mines and fertilizer plants in 1975. The Ha Bac fertilizer plant began Vietnam's first production of nitrogen fertilizer in December 1975. Its phosphate fertilizer capacity was being expanded at yearend, as was the phosphate plant at Van Dien. The Lao Cai apatite mine, which supports the superphosphate plant at Lam Thao, was also under expansion. The Vietnamese have been negotiating with a Japanese firm for the construction of a fertilizer plant worth about $50 million. The plant would have an annual capacity of 290,000 tons of sulfuric acid, 189,000 tons of phosphoric acid, and 90,000 tons of diammonium phosphate. Contract signing was awaiting the approval of financing by the Japan Export-Import Bank.

Mineral Fuels.—Coal production claims for the year were uniformly optimistic, with no hint of production problems. The target output was 5.3 million tons in 1975. Actual production was believed to be at least 4.0 million tons. Washed coal production exceeded the 1974 output by 30% to 40%. The Coc Sau unit of the anthracite complex at Hon Gai produced over 1 million tons. Several other units reported major production increases resulting from mine expansions and improvements. Further increases were believed hampered by inadequate coal washing capacity and bottlenecks in the transportation of coal to the consumer. Up to 650,000 tons of Hon Gai anthracite were exported to Japan during the year. A Japanese company was expected to help finance a coal-calcining plant to produce semifinished carbon anodes from high-grade anthracite.

Hanoi announced in August the formation of an Oil and Natural Gas Commission under the Council of Ministers. Rumors that Soviet geologists have found onshore oil in North Vietnam remain unconfirmed. At yearend, plans were being made to resume offshore geological exploration, possibly with Japanese or other foreign technical assistance.

SOUTH VIETNAM [18]

April 1975 saw the end of the prolonged war which left over 57% of the population homeless and over 16% killed or wounded. The new Government, headed by Nguyen Huu Tho, subsequently took over control of all major industrial and commercial undertakings.

Geological conditions in South Vietnam are favorable for mineral discoveries; however, no significant mineral surveys using geochemical or airborne geophysics had ever been conducted. No metallic ores of any consequence have ever been mined, but prospects for bauxite, iron, and nickel are promising. As a result of the protracted hostilities, mineral production was at a virtual standstill through most of the year.

The old Bien Hoa rolling mill was reopened with North Vietnamese technical assistance. The production level was 86 tons per day of structural and reinforcing steel. The capacity of the plant, which uses scrap steel as raw material, was rated at 20,000 tons of reinforcing bars per year.

Some salt and gypsum were produced, and cement production dropped to an estimated 50,000 tons.

Only toward yearend, when some semblance of order had been restored, did production of fertilizers from small plants resume after repairs. No reliable production figures are available, but fertilizer plants were reportedly operating in Dong

[18] By Gordon L. Kinney.

Nai, Thuan Hai, and Can Tho, and the first lime fertilizer plant in An Giang Province was under construction in Long Xuyen.

Coal deposits were limited to one small field near Nong Son in central South Vietnam. Coal production reportedly resumed late in the year, but no output figures are available.

No oil or natural gas has ever been produced in South Vietnam. Developments in offshore oil exploration, however, were of major significance. After the two discoveries by the Shell-Cities Service consortium in 1974, exploration by the Mobil Group continued, with a strike in February 1975 about 190 kilometers southeast of Saigon. The well tested at 2,400 barrels per day of 35° API gravity crude oil. The fall of the Government 2 months later forced the halt of all operations. The wells were plugged, and the oil companies returned to their bases in Singapore. It was reported that the companies had invested nearly $100 million in the concession rights, surveys, and drilling.

A few months after the Provisional Revolutionary Government consolidated control in Saigon, it announced a willingness to talk with the international oil companies. As of yearend only the Shell-Cities Service Group was reported to have had meetings with Vietnamese officials. What terms or conditions the Vietnamese were asking for are not known. It can be expected, however, that very tight controls will be placed on whatever companies are allowed to return to Vietnamese waters.

The Mineral Industry of Other Countries of the Near East

By Candice Stevens [1]

CONTENTS

In 1975, the petroleum industry was the focal point of mineral activity in the nations along the eastern edge of the Mediterranean Sea and the eastern and southern edges of the Arabian peninsula, which are the subject of this chapter. Oil revenue constituted the major source of Government income in the United Arab Emirates, Qatar, Oman, Bahrain, and Syria. Of the non-oil-producing countries, Jordan, Lebanon, and the People's Democratic Republic of Yemen were important centers for the refining of imported crude. In addition, Jordan, Lebanon, and Syria received supplemental income from pipeline transit fees.

A general trend began in 1974 and continued in 1975 towards increased government participation in indigenous oil operations. In 1974, two United Arab Emirates Governments—those of Abu Dhabi and Dubai—Oman, Qatar, and Bahrain each acquired a 60% share in the operations of foreign oil companies within their borders. In 1975, Dubai negotiated 100% control of its domestic oil industry, and Abu Dhabi, Qatar, and Bahrain announced their intentions of a similar takeover. As in Dubai, future arrangements were expected to keep the foreign companies involved in oil operations, providing technical assistance, markets, and transportation.

The area was the scene of major oil exploration activity during the year. The search for additional petroleum reserves continued both onshore and offshore in the countries of Bahrain, Oman, and Qatar, and in the Emirates of Abu Dhabi, Dubai, and Sharjah. Taking a new policy direction, Syria opened up both onshore and offshore tracts for foreign oil exploration. Concession areas were also granted in the non-oil-producing countries of Jordan, the People's Democratic Republic of Yemen, and the Yemen Arab Republic, and in the Emirates of Ajman, Fujairah, Ras al-Khaimah, and Umm al-Qaiwain. In Lebanon, continuing civil disorders interrupted the review of bids and granting of oil exploration rights.

The substantial oil price increases since 1973 considerably enhanced the liquidity position of the region's oil-producing countries, which invested a large part of their petrodollars in domestic industrialization projects. The less advantaged countries re-

[1] Economist, International Data and Analysis.

ceived indirect benefits from augmented petroleum revenue, in the form of foreign aid and loans extended through national and multinational channels. Abu Dhabi, in particular, earmarked a large share of its oil income for foreign assistance; the countries that received loans and grants from the Abu Dhabi Fund for Arab Economic Development included Bahrain, Jordan, Syria, the People's Democratic Republic of Yemen, and the Yemen Arab Republic and most of the other members of the United Arab Emirates. For the most part, any constraints encountered in the region's development efforts were nonfinancial ones posed by manpower shortages, infrastructure bottlenecks, and administrative shortcomings.

Priority was given to projects based on the utilization of the area's vast oil and natural gas resources. Refinery construction or expansion was underway in Jordan, Qatar, Syria, and Abu Dhabi. Previously flared natural gas was to be extracted for the production of natural gas liquids (NGL) in Oman, Qatar, Abu Dhabi, and Dubai, and converted into liquefied natural gas (LNG) in Qatar and Abu Dhabi. Also planned were fertilizer plants based on natural gas feedstocks in Oman and Qatar and a large petrochemical complex in Qatar.

Oil wealth was also being put to use in long-range attempts at economic diversification. Bahrain centered its efforts on the development of its aluminum industry, using abundant natural gas supplies, while both Syria and Dubai embarked on the construction of aluminum-processing complexes. Syria also contracted for the expansion of its steel mill capacity, and the construction of a direct reduction steel mill was in progress in Qatar. In Oman, the development of copper-processing facilities based on domestic copper reserves was under study. Cement production was already established in the region, with Jordan, Lebanon, Syria, Qatar, and the Yemen Arab Republic having cement plants in operation; Oman, Dubai, and Sharjah also planned to commence cement production for domestic use. Perhaps the most massive projects undertaken were the construction of major dry docks both in Bahrain, for the Organization of Arab Petroleum Exporting Countries (OAPEC), and in Dubai, which was to be the world's largest at its completion in 1978.

Table 1 lists production of selected mineral commodities in the countries covered by this chapter.

Table 1.—Other Countries of the Near East: Production of mineral commodities

Area, commodity, and unit of measure	1973	1974	1975 P
BAHRAIN [1]			
Aluminum, primary smelter ____ metric tons	102,600	118,000	116,300
Gas, natural:			
Gross production ____ million cubic feet	82,855	100,010	101,546
Marketed production [2] ____ do	56,575	68,255	73,343
Petroleum:			
Crude ____ thousand 42-gallon barrels	24,948	24,597	20,805
Refinery products:			
Gasoline ____ do	8,607	9,742	9,667
Jet fuel ____ do	11,839	8,658	8,842
Kerosine ____ do	1,529	2,334	2,939
Distillate fuel oil ____ do	19,704	19,001	20,733
Residual fuel oil ____ do	35,872	37,877	28,052
Lubricants ____ do	745	666	--
Other ____ do	8,194	10,449	6,186
Refinery fuel and losses ____ do	4,263	2,669	2,256
Total ____ do	90,753	91,396	78,675
JORDAN			
Cement, hydraulic ____ thousand metric tons	617	596	572
Clays ____ do	5	10	10
Fertilizer materials, crude phosphate rock ____ do	r 1,081	1,675	1,353
Gypsum ____ do	30	30	30
Iron and steel semimanufactures ____ do	28	25	NA
Lime ____ do	3	3	3
Petroleum refinery products:			
Gasoline ____ thousand 42-gallon barrels	947	1,202	1,684
Jet fuel ____ do	361	490	584
Kerosine ____ do	873	875	899
Distillate fuel oil ____ do	1,259	1,437	1,673
Residual fuel oil ____ do	1,274	1,283	969
Other:			
Liquefied petroleum gas ____ do	199	239	296
Asphalt ____ do	244	239	222
Unspecified ____ do	833	1,032	--
Refinery fuel and losses ____ do	267	453	332
Total ____ do	6,257	7,250	6,659
Salt ____ thousand metric tons	16	15	e 15
Stone:			
Limestone ____ do	3,000	3,000	3,500
Marble ____ thousand square meters	100	100	1,150
LEBANON [1]			
Cement, hydraulic ____ thousand metric tons	1,659	1,744	e 1,000
Gypsum ____ do	10	13	e 13
Iron and steel semimanufactures e ____ do	300	350	350
Lime ____ do	152	177	e 180
Petroleum refinery products:			
Gasoline ____ thousand 42-gallon barrels	4,251	4,904	4,062
Jet fuel ____ do	1,610	1,663	1,297
Kerosine ____ do	178	172	205
Distillate fuel oil ____ do	2,716	3,179	3,234
Residual fuel oil ____ do	6,367	6,079	4,833
Other:			
Liquefied petroleum gas ____ do }	704	875	462
Unspecified ____ do }			151
Refinery fuel and losses ____ do	1,416	849	949
Total ____ do	17,242	17,721	15,193
Salt ____ thousand metric tons	36	35	e 35
OMAN [1]			
Gas, natural:			
Gross production e ____ million cubic feet	r 90,000	r 90,000	105,000
Marketed production e ____ do	1,500	1,500	1,700
Petroleum, crude ____ thousand 42-gallon barrels	106,926	106,046	124,600
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN			
Petroleum refinery products:			
Gasoline ____ do	3,285	3,767	1,343
Jet fuel ____ do	2,525	1,928	1,176
Kerosine ____ do	1,106	1,081	760
Distillate fuel oil ____ do	3,767	4,368	2,268
Residual fuel oil ____ do	12,185	8,135	4,835
Other ____ do	21	30	592
Refinery fuel and losses ____ do	1,676	596	859
Total ____ do	24,565	19,905	11,833
Salt e ____ thousand metric tons	75	75	75

See footnotes at end of table.

Table 1.—Other Countries of the Near East: Production of mineral commodities—Continued

Area, commodity, and unit of measure	1973	1974	1975 p
QATAR [1]			
Cement, hydraulic e ---thousand metric tons--	100	100	100
Gas, natural:			
Gross production ---million cubic feet--	r 219,409	181,905	192,005
Marketed production [3] ---do----	r 55,797	45,909	78,010
Petroleum:			
Crude ---thousand 42-gallon barrels--	208,152	189,348	159,482
Refinery products:			
Gasoline ---do----	69	e 54	550
Jet fuel ---do----	--	--	229
Kerosine ---do----	36	e 30	36
Distillate fuel oil ---do----	73	e 43	519
Residual fuel oil ---do----	36	e 69	17
Other ---do----	23	--	2
Refinery fuel and losses ---do----	19	e 21	99
Total ---do----	256	e 217	1,452
SYRIA [1]			
Cement, hydraulic ---thousand metric tons--	848	965	859
Fertilizer materials, crude phosphate rock ---do----	150	603	857
Gas, natural:			
Gross production e ---million cubic feet--	37,000	40,000	58,000
Marketed production ---do----	r 6,992	6,356	e 7,000
Gypsum e ---thousand metric tons--	15	15	15
Petroleum:			
Crude ---thousand 42-gallon barrels--	38,170	45,352	65,930
Refinery products:			
Gasoline ---do----	2,542	2,406	2,915
Kerosine ---do----	2,046	1,604	2,899
Distillate fuel oil ---do----	4,334	3,857	4,692
Residual fuel oil ---do----	4,083	4,056	5,508
Other:			
Liquefied petroleum gas ---do----	664	741	302
Asphalt ---do----			515
Refinery fuel and losses ---do----	1,094	1,013	841
Total ---do----	14,763	13,677	17,672
Salt ---thousand metric tons--	35	40	e 40
Sand, glass e ---do----	15	15	15
UNITED ARAB EMIRATES [1 4]			
Abu Dhabi:			
Gas, natural:			
Gross production ---million cubic feet--	r 483,456	460,995	432,002
Marketed production [3] ---do----	r 44,178	42,377	38,493
Petroleum, crude ---thousand 42-gallon barrels--	479,192	516,110	511,730
Ajman: Marble e ---square meters--	13,000	26,000	NA
Dubai:			
Gas, natural:			
Gross production e ---million cubic feet--	r 88,000	r 101,000	102,000
Marketed production e ---do----	17,000	19,000	20,000
Petroleum, crude ---thousand 42-gallon barrels--	80,207	90,338	92,710
Sharjah:			
Gas, natural:			
Gross production e ---million cubic feet--	--	9,000	15,000
Marketed production e ---do----	--	(5)	(5)
Petroleum, crude ---thousand 42-gallon barrels--	--	10,037	13,870
YEMEN ARAB REPUBLIC [1]			
Cement ---thousand metric tons--	12	36	e 50

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

[1] In addition to the commodities listed, crude construction materials such as common clays, stone, 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] Includes gas reinjected to reservoirs, if any.

[4] 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.

[5] No marketed production reported; there probably is some small field use.

BAHRAIN

Bahrain's oil revenue increased from $85 million[2] in 1974 to approximately $280 million in 1975, due to both a rise in price and a greater government share in oil income. The petroleum industry continued to be the main pillar of the Bahraini economy, accounting for nearly 83% of government revenue despite declining rates of production at both the Abu Safah and Awali Fields. The Abu Safah Field in the Persian Gulf, in which Bahrain shares a 50% interest with Saudi Arabia, yielded only about 22 million barrels in 1975, compared with 44 million barrels in 1974. The Awali Field, situated at the center of the main Bahrain island, evidenced a similar downward trend as output fell from 25 million barrels in 1974 to 21 million barrels in 1975. Although exploration continued onshore and also offshore by the Superior Oil Co., which was granted a 35-year concession for exploration of 4,235 square kilometers of offshore waters, no new oil discoveries were made. However, Bahrain maintained its position as an important refining center in processing a substantial portion of Saudi Arabian crude, approximately 55 million barrels in 1975, in addition to all domestic production. Total throughput at the refinery at Awali, which had a total capacity of 250,000 barrels per day, averaged 215,500 barrels per day in 1975.

The conservation, production, refining, and marketing of Bahrain's petroleum has been controlled since 1930 by Bahrain Petroleum Co., Ltd. (BAPCO), a subsidiary of California Texas Petroleum Co. (CALTEX). BAPCO and the Bahrain Government reached an agreement in 1974 in which the Government acquired a 60% participation in BAPCO's crude oil production; in 1975 the Government announced its intention to extend this to 100% ownership. BAPCO will, however, continue to operate the refinery at Awali.

The production of natural gas in Bahrain was also to continue under the supervision of BAPCO, whose gas systems in the Khuff and Arab zones were expanded in 1975 to meet increased demand for the Government's industrial development projects and the BAPCO refinery. Natural gas production increased approximately 1.5% from 274 million cubic feet per day in 1974 to an average of 278 million cubic feet per day in 1975. Bahrain's gas reserves, which were estimated at 8 trillion to 11 trillion cubic feet, were projected as lasting another 50 to 75 years at current levels of consumption. In addition to fueling the country's single aluminum smelter, the natural gas was used for pressure maintenance in the Awali Field and for the commercial production of electricity.

Faced with the prospect of ultimate oil depletion, Bahrain has in recent years attempted to diversify its economic base, principally through the development of an aluminum industry using the abundant natural gas supplies. The production of aluminum at the smelter operated by Aluminium Bahrain, Ltd. (ALBA) continued as a successful venture in 1975 and prompted the Bahrain Government to increase its equity by buying out three of the remaining six shareholders. ALBA, originally a consortium of seven shareholders (the Bahrain Government, Kaiser Aluminum & Chemical Corp., Amalgamated Metal Corp., General Cable Corp., AB Elektrokopper, Western Metals Corp., and Breton Investments), was owned 77.9% by the Bahrain Government, 17% by Kaiser Aluminum, and 5.1% by Breton Investments at yearend 1975. The smelter, which opened in May 1971 near Askar on the island's east coast, produced 116,300 tons of aluminum in 1975, only 1,700 tons less than in 1974. This decrease was caused by a rectifier fire in November which necessitated the temporary closure of the plant. All ingot production was allotted to shareholders in proportion to their equity holding, and although the Amalgamated Metal Corp. no longer held equity, it was expected to continue marketing a large part of ALBA's production on behalf of the Bahrain Government.

Plans were made in 1975 for further additions to the aluminum operation, which received its alumina feedstock from Western Aluminium of Australia, a subsidiary of Aluminum Co. of America (Alcoa). A public company was formed to setup an aluminum extrusion plant which would permit local industries to obtain aluminum

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[2] Where necessary, values have been converted from Bahraini dinars (BD) to U.S. dollars at the rate of BD1=US$2.53.

in a workable form and provide a foundation for ancillary industries using aluminum products. In addition, Vereinigte Aluminium-Werke (VAW) of West Germany was contracted to study the feasibility of building a $100 million aluminum rolling mill in Bahrain, using rolling slab from the primary smelter.

Bahrain also planned to compensate for decreasing oil reserves by capitalizing on its favorable location at the crossroads of the bulk of international petroleum shipping. Site work began in early 1975 on a major drydock to be located on Muharraq Island, 6 kilometers off the northern coast of the main Bahrain island. The OAPEC-sponsored drydock, known as the Arab Shipbuilding and Repair Yard (ASRY), was estimated to cost $200 million and was expected to be fully operational by 1977–78. The Lisnave Group, a Portuguese shipbuilding company, was the original consultant for the project, while the final construction contract was acquired in late 1975 by the South Korean firm Hyundai. ASRY was to carry out hull repairs in its initial stages, and later extend its operations to superstructure work and overhauls of engines and turbines. The single drydock, which was projected at a length of 375 meters and a width of 75 meters, was to be capable of accommodating vessels up to about 500,000 deadweight tons. Apart from servicing tankers in transit, it was predicted that the dock would become pivotal to the Arab Maritime Petroleum Transport Co. (AMPTC), operated by OAPEC.

Further infrastructure development supported the Government's diversification program. Construction continued in 1975 on the new power and desalination plant at the north end of Sitra Island, which was initially to generate 60,000 kilowatts and produce 2½ million gallons of desalinated water per day. In addition, improvements were scheduled for Bahrain's port and transit facilities in support of anticipated increases in aluminum and petrochemical exports as well as of entrepôt trade. In 1975, as in previous years, about one-third of the goods traversing Bahrain's single port, Mina Sulman, were reexported, principally to other Persian Gulf States. The Mina Sulman port, which consisted of six berths, was designated for an extension of six additional berths and supporting facilities. Bahrain's position as a cargo transit port was also to be enhanced by the construction of a causeway linking it to the eastern province of Saudi Arabia, which was to cover the cost of approximately $250 million.

Table 2.—Bahrain: Foreign trade of crude petroleum and petroleum refinery products

(Thousand 42-gallon barrels)

Commodity	1973	1974	1975
EXPORTS			
Crude oil	--	2,831	--
Petroleum refinery products:			
Gasoline	8,311	9,366	8,996
Jet fuel	9,962	7,674	7,148
Kerosine	2,107	2,320	2,922
Distillate fuel oil	19,254	663	18,723
Residual fuel oil	9,666	37,152	26,730
Lubricants	718	--	--
Other, including naphtha	11,051	10,373	--
Total	61,069	67,548	64,519
BUNKER LOADINGS			
Petroleum refinery products:			
Distillate fuel oil	636	NA	836
Residual fuel oil	6,180	NA	3,443
Total	6,816	NA	4,279
IMPORTS			
Crude petroleum	64,744	64,521	55,423
Petroleum refinery products:			
Lubricants	--	3	5

NA Not available.

JORDAN

Phosphate rock, produced primarily for export, continued to dominate Jordan's mineral industry in 1975. This was true despite a decline in phosphate exports from 1.5 million tons in 1974 to 1.1 million tons in 1975, due to weakened international demand. However, because of high prices at the beginning of 1975, phosphate export earnings remained at the record level of $61 million[3] and accounted for about 37% of the value of total exports. Increased phosphate revenues were a contributing factor in Jordan's general upswing, which began in 1972 and continued in 1975 when the gross national product (GNP) again attained the 1974 level of about $1 billion. The mining sector contributed about 15% of this total; key industries in addition to phosphate production were cement manufacturing and petroleum refining based on imported crude. Included in the 15% were the earnings of the gypsum, clay, lime, and salt, industries production levels of which remained virtually the same as in 1974. Production of Jordan mineral commodities in 1975 is reported in table 1. Potential additions to Jordan's mineral sector, subject to further exploration and development, were reserves of potash, copper, manganese, uranium, and vanadium.

One objective of Jordan's focus on expansion of export-oriented industries based on indigenous mineral resources has been the need to reduce its chronic balance of trade deficit. In 1975, Jordan's exports increased very slightly while its volume of imports continued upward rapidly, producing a record trade deficit of $606 million. However, as in past years, budget support from other Arab countries and the United States and development loans and grants helped to cover the shortfall of domestically generated revenues. Foreign assistance, which in 1975 ran at the high figure of $870 million, plus large remittances from Jordanians working abroad, helped achieve a balance of payments surplus of about $150 million for the year.

The reopening of the Suez Canal in July greatly strengthened Jordan's position in relation to its important East European mineral markets and necessitated the upgrading of port and transportation facilities. The anticipated growth in mineral exports was expected to be through the single Red Sea port of Aqaba, where handling capacity was slated for an increase from 600,000 tons to 1.5 million tons per year. In addition to this expansion scheme, phosphate storage capacity was to be increased from 180,000 tons to 410,000 tons, and average phosphate loading time to be improved from 2,000 tons per hour to 4,700 tons per hour. The new rail line between the El Hasa phosphate mines and Aqaba, completed in October 1975, greatly facilitated phosphate transport to the port in addition to providing a continuous rail link from Aqaba to the Syrian border. Concurrently with the port expansion, improvements in road access to Aqaba were to be implemented, most notably a new road linking Aqaba directly with the Dead Sea.

The importance of phosphate production to the Jordanian economy was illustrated in the 5-year plan to be launched in 1976, which anticipated that phosphate exports would contribute almost 60% of total commodity exports by 1980. While the 3-year plan of 1972–75 proved a little over optimistic in its aims, substantial progress was made in mineral production, which achieved an average annual growth rate of 23%. As in the 3-year plan, a major objective in the next 5 years will be further expansion of the phosphate operations at the El Hasa and Ruseifa mines, both of which are operated by the Government-owned Jordon Phosphate Mines Co. Specifically, the plan involved increasing productive capacity at El Hasa, located nearly 200 road kilometers north of Aqaba, from 1.2 million to 2.4 million tons per year from the existing opencast mine, and developing a 1.8-million-ton-per-year underground operation at that same location. A smaller expansion project to increase phosphate production capacity to 1 million tons per year was scheduled at Ruseifa, located about 15 kilometers by road northeast of Amman or about 160 kilometers farther from the port of Aqaba than El Hasa. Plans were also made to further explore and develop the major phosphate deposits situated near the Amman-Aqaba rail link, where reserves were estimated at over 300 million tons. Total phosphate re-

[3] Where necessary, values have been converted the rate of JD1=US$3.18.
from Jordanian dinars (JD) to U.S. dollars at

serves in the country were estimated at 3 billion tons, with about 15 million tons extracted at yearend 1975.

The largest project designated by the 5-year plan was the construction of a $180 million fertilizer export plant near Aqaba, which was expected to produce approximately 600,000 tons per year of monoammonium phosphate and diammonium phosphate for distribution in Asia, Africa, and the Middle East. The scheme was undertaken jointly by the Jordan Fertilizer Industry Co., the Government, the International Finance Corp., and the U.S.-based contractor, Agrico Chemical Co. It was hoped that by 1980 the plant's export earnings would be nearly $100 million.

Cement manufacturing declined slightly, from 596,000 tons in 1974 to 572,200 tons in 1975. Nevertheless, the West German firm Polysius was contracted to build a new cement plant in south Jordan, expected to operate at a capacity of 2,000 tons per day.

Oil exploration in 1975 in the northern and western parts of the country under the aegis of the U.S. Filon Corp. produced some promising results, and the drilling of the first exploration well based on these studies was scheduled for the fall of 1976. Contracts were awarded to expand the Zerqa refinery, situated a few kilometers northeast of the capital, Amman, which would increase its capacity from 16,000 to 60,000 barrels per day. In 1975, the Zerqa refinery continued to receive crude oil deliveries over the Trans-Arabian Pipeline (TAPline), even though Jordan's payment to TAPline ceased in protest of the company's request for a sixfold increase in the price of crude. At the same time, TAPline terminated its payment of transit fees to Jordan for the passage of crude oil over the pipeline through Jordan to Lebanon. The price dispute had not been resolved by yearend 1975.

While phosphate remained the key mineral product in 1975, several other minerals loomed as potential significant contributors to Jordan's economy. Work was begun on a project to recover more than a million tons of potash per year from deposits off the southeastern shore of the Dead Sea. The potash project, supervised by the Jacobs Engineering Group, Inc., of California, was to include a full-scale solar evaporation plant and facilities for refining the extracted brine. An investment was also made in a further study of the copper deposits in the southern Wadi Araba region and the viability of establishing a copper processing plant on that site. Reserves were estimated at 65 million tons grading 1.6% copper, which would permit extraction of 10,000 to 15,000 tons of ore per day.

In addition to copper, the Wadi Araba region was identified as rich in manganese ore, with proved reserves at 1.5 million tons. Further evaluation of the economic importance of the manganese deposits was anticipated, as the Nation's total reserves were believed to be about 5 million tons. In November, preliminary uranium finds were made in the Dead Sea area of Ghor Al Safi, where reserves were reported at between 200,000 and 300,000 tons of ore. This discovery was being investigated for commercial possibilities, as were reports of the existence of 1 million tons of vanadium in the same region.

Table 3.—Jordan: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum, unwrought and semimanufactures	290	308	Syria 250; Lebanon 53.
Copper:			
Matte	909	529	Lebanon 442; West Germany 64.
Seimmanufactures	37	--	
Iron and steel:			
Scrap	9,735	20,147	Lebanon 19,982.
Semimanufactures	37	--	People's Republic of China 8,540.
Zinc, metal, all forms, including alloys	--	34	All to Syria.
NONMETALS			
Cement	196,305	209,181	Saudi Arabia 141,065; Syria 40,962.
Clay products, refractory	278	324	Mainly to Iraq.
Fertilizer materials, crude, phosphatic	1,088,575	1,468,958	NA.
Salt	1,288	748	Mainly to Syria.
Stone, sand and gravel:			
Dimension stone, crude and partly worked:			
Calcareous	7,795	19,332	Syria 12,366; Lebanon 2,687.
Granite	1,241	--	
Crushed stone and gravel	2,614	5,432	Lebanon 2,525; Syria 2,486.
Sand	5	76	Mainly to Saudi Arabia.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen	15,246	10,715	Saudi Arabia 6,587; Syria 4,107.
Gas, hydrocarbon, natural	77	2,003	Mainly to Syria.
Petroleum, refinery products:			
Gasoline..thousand 42-gallon barrels	4	--	
Distillate ..do	--	436	All to Syria.
Residual fuel oil ..do	r 145	88	Do.
Other, n.e.s ..do	r 3	6	Do.

r Revised. NA Not available.

Table 4.—Jordan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal sources, 1974
METALS			
Aluminum including alloys, semimanufactures	929	1,003	Lebanon 448; Hong Kong 219.
Copper including alloys, all forms	r 136	458	West Germany 169; Lebanon 149; United Kingdom 50.
Iron and steel:			
Scrap	748	1,581	NA.
Pig iron, ferroalloys and similar materials	26,223	30,694	Republic of South Africa 16,732; Canada 9,983.
Steel, primary forms	326	--	
Semimanufactures	r 49,825	53,802	Belgium-Luxembourg 15,202; Japan 6,904.
Lead:			
Oxides	76	--	
Metal including alloy	2,338	1,770	Kuwait 1,026; Saudi Arabia 611.
Titanium oxides	75	139	Denmark 41; United Kingdom 26; Netherlands 10.
Other:			
Base metals including alloys, unwrought n.e.s	50	47	All from Belgium-Luxembourg.
NONMETALS			
Abrasives, natural, grinding and polishing wheels and stones	189	53	Italy 22; West Germany 11.
Cement	8,412	7,874	Lebanon 5,680.
Chalk	--	296	United Kingdom 118; Belgium 75; France 55.
Clays and clay products:			
Crude clays	359	--	
Products:			
Refractory	978	882	West Germany 483; People's Republic of China 240; United Kingdom 153.
Nonrefractory	1,727	2,679	Lebanon 314; Bulgaria 232; Turkey 110.
Fertilizer materials, crude and manufactured:			
Nitrogenous	6,125	8,185	France 4,506; Austria 1,200.
Phosphatic	3,504	2,952	Netherlands 1,560; West Germany 547.
Potassic	742	310	Netherlands 165; West Germany 145.
Other n.e.s	5,456	2,743	Mainly from Kuwait.
Lime	1,767	1,716	All from Lebanon.
Sodium and potassium compounds, caustic soda	285	531	Kuwait 428; West Germany 65.
Stone, sand and gravel, dimension stone, marble	2,063	3,711	Saudi Arabia 1,780; Italy 1,070; Lebanon 565.
Sulfur:			
Elemental	2,596	3,992	Iraq 1,861; Kuwait 1,081; France 596.
Sulfuric acid	2,524	2,903	Mainly from Kuwait.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	222	130	West Germany 40; United Kingdom 19.
Coke and semicoke	491	646	Lebanon 483; West Germany 163.
Petroleum:			
Crude ...thousand 42-gallon barrels	r 4,442	4,864	All from Saudi Arabia.
Refinery products:			
Gasoline ...do	r 5	2	Lebanon 1.
Kerosine ...do	--	8	Saudi Arabia 3; Italy 3; Netherlands 2.
Lubricants ...do	r 42	67	Iraq 25; Lebanon 14; Italy 9.
Other, bituminous mixtures ...do	--	1	Mainly from United States.
Total ...do	47	78	

r Revised. NA Not available.

LEBANON

Lebanon's mineral activities have been primarily limited to cement manufacturing based on domestic raw materials, and petroleum refining based on crude oil imported from Iraq and Saudi Arabia. In 1975, internal disorders virtually halted the production of gypsum, limestone, and clay for use in Lebanon's three cement plants and brought cement production to a standstill. Total throughput at the country's two oil refineries was approximately 15 million barrels in 1975, a decrease of 12% from the 1974 level. This decline in input, coupled with a reduction in prices, resulted in a 15% decrease in the total value of Lebanon's refined petroleum products, from $65.5 million[4] in 1974 to $55.7 million in 1975.

Despite continued exploration activities in 1975, indigenous petroleum resources had not been found. In an attempt to expand oil exploration in its offshore acreage, the Lebanese Government in midyear invited international bids for exploration rights to the entire Continental Shelf under production-sharing service contracts. Permits which covered approximately 90% of Lebanese onshore territory had previously been granted to three companies—Compagnie Libanaise des Pétroles, Shaheen Oil Co., and Shaheen and Abdini Oil Co. A law passed in July 1975 gave the Government authority to cancel existing offshore and onshore exploration permits upon failure of the companies to fulfill financial obligations or scheduled technical programs. However, the civil disorder in Lebanon interrupted the review of the earlier agreements and caused the deadline for the submission of new bids to be postponed indefinitely.

The contracts under which Lebanon received Iraqi and Saudi Arabian crude oil as feedstock for its two refineries were both under renegotiation at yearend 1975. In accordance with an agreement concluded in early 1973, the nationalized Tripoli refinery in northern Lebanon was supplied by pipelines operated by the Iraq National Oil Co. (INOC) with a maximum annual allocation of 11.5 million barrels of Kirkuk crude oil for a 3-year period. Since the quantity was not entirely used by the Tripoli refinery during 1975, the Iraqi Government agreed to supply the unused balance during the early part of 1976 at the reduced contract price of $3.05 per barrel. All further crude oil supplies from Iraq were to be transferred under the financial provisions of a new Iraqi-Lebanese transit agreement. The revised terms, however, were being negotiated under circumstances that had significantly changed since the conclusion of the original contract in 1973. In 1975, Iraq constructed a strategic pipeline linking its northern oilfields to export terminals on the Persian Gulf. Crude oil exported from Iraq's southern ports was less costly than that exported from Mediterranean ports, due in part to prevailing low tanker rates and continued disagreement with Syria regarding transit fees. Consequently, the transfer of Iraqi crude oil by overland pipeline for export from Tripoli, which in 1975 earned Lebanon gross revenues of $14 million, was expected to decline. At yearend 1975, Iraq and Lebanon had not set terms for the delivery of Kirkuk crude oil to the Tripoli refinery, nor for the export of Iraqi oil from that Mediterranean port.

For similar reasons, in early 1975, Saudi Arabia ceased pumping crude through TAPline for export from Lebanon's other major terminal, Sidon. A considerable price advantage was realized by shipping Saudi Arabian oil to Europe from the port of Ras Tanura on the Persian Gulf via the Cape of Good Hope. The cessation of TAPline's export operations in Lebanon, however, interrupted the crude oil supply to Lebanon's second refinery at Zahrani, just south of Sidon. Although owned by the Mediterranean Refining Company (MEDRECO), which in turn was owned by CALTEX and the Mobil Oil Co., the 17,500-barrel-per-day-capacity refinery was taken under Government sequestration in August 1973. As an outgrowth of a lengthy dispute regarding exrefinery pricing, the Lebanese Government confiscated the MEDRECO refinery's daily crude oil requirements from TAPline without payment for the period of August 1973 to February 1975. After that time, the MEDRECO refinery resorted to processing crude oil from the 2 million barrels held in storage at

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[4] Where necessary, values have been converted from Lebanese pounds (L£) to U.S. dollars at the rate L£1=US$0.3922.

Sidon, which stocks were replenished later in the year by limited deliveries from TAPline. The additional crude oil was supplied under a provisional pricing agreement concluded by Lebanon, Saudi Arabia, and TAPline, which fixed the rate per barrel at the lesser of either the tax-paid cost or the realized market price. In accordance with this formula, the Lebanese Government paid approximately one-third of its $1 million debt to TAPline for the crude sequestered since 1973. At yearend, no agreement had been reached on a formula for the payment of the cost of future deliveries to the MEDRECO refinery.

Arrangement were not concluded regarding the construction of Lebanon's long-planned third refinery, which was to be a joint venture in conjunction with Saudi Arabia's General Petroleum and Mineral Organization (PETROMIN). Negotiations between the Governments of Lebanon and Saudi Arabia regarding the new refinery were postponed pending the resolution of the TAPline dispute and the resumption of internal order in Lebanon.

OMAN

Increased oil production and a greater Government share in petroleum earnings accounted in large part for Oman's sustained economic growth in 1975. Aside from petroleum and some natural gas, which was flared, no mineral commodities were produced. The petroleum industry contributed approximately 75% of Oman's GNP of $1.6 billion,[5] an increase of 14% over the 1974 GNP of $1.4 billion. Since 1974, the Oman Government has controlled 60% of the country's only oil-producing company, Petroleum Development (Oman), Ltd. (PDO). PDO bought back most of the Government's participation oil for resale to other shareholders in the company, whose equity was held 34% by Royal Dutch/Shell, 4% of Compagnie Française des Pétroles, and 2% by Portuguese Participations and Explorations Corporation (PARTEX).

Production of crude oil in Oman totaled 124,600,000 barrels (341,370 barrels per day), in 1975, compared with 106,046,000 barrels (290,500 barrels per day) in 1974. Approximately 82% of the 1975 output was derived from the four older fields, Fahud, Natih, Yibal, and al-Huwaisah, all situated in an area 280 kilometers southwest of the capital, Muscat. Four new fields, brought onstream between February and August 1975 about 128 kilometers southeast of the older fields, accounted for the balance of production. The Ghaba North, Qarn Alam, Saih Nihayda, and Saih Rawl Fields averaged 61,040 barrels per day for the year and attained a level of 100,000 barrels per day by yearend. These fields were expected to compensate in future years for declining production at Oman's older fields, where secondary recovery waterflood programs were in operation.

Continued exploration during 1975 yielded no new oil discoveries. However, development of the Lehkwair Field, located to the west of Saih Rawl, was to begin in early 1976. Future exploration and development activities were scheduled for the southern province of Dhofar, where the Amal Field was estimated to hold significant reserves of high-viscosity crude. The Oman Government awarded two new oil exploration concessions in 1975. France's Essence et Lubrifiant de France—Enterprise de Recherches et d'Activité Pétrolières (Elf–ERAP) and Japan's Sumitomo Petroleum Development were granted a 7,000-square-kilometer tract in the Abu al-Tubul area near the Saudi Arabian border. The Sunaina tract in northern Oman was awarded to the Texas-based company, Quintana Overseas. Offshore, exploration drilling was continued by West Germany's Wintershall consortium in a 480-kilometer stretch off Oman's northern coastline. Another consortium, consisting of Sun Oil Co., Home Oil Co., Canadian Industrial Gas and Oil, and Deutsche Shachtbau, maintained prospecting activities in a 13,000-square-kilometer tract south of Masirah Island. A third offshore concession is held by Elf-ERAP in a 5,000-square-kilometer area in the Straits of Hormuz along the shore of Musandam Peninsula.

Except for additions to stocks, all crude oil produced in Oman in 1975 was exported. Crude was transported from the four older fields by a 320-kilometer pipe-

[5] Where necessary, values have been converted from Omani rials (RO) to U.S. dollars at the rate of RO0.346=US$1.00.

line to a tanker-loading terminal at the Mina al Fahal port on the Gulf of Oman. During 1975, a 144-kilometer pipeline was completed, linking the four new oilfields to the original pipeline. Petroleum accounted for 95% of Oman's exports in 1975, earning revenues of $1,200 million. The principal destinations of Oman's crude exports were Japan and Western Europe. Western Europe was also the leading source of Oman's imports, and the United Kingdom continued to be the country's leading trading partner. Petroleum products, supplied primarily by Iran and the United Kingdom, accounted for about 5% of total imports and cost an estimated $31.8 million.

During 1975, the Oman Government considered various proposals for using the associated natural gas from oil production activities; reserves were estimated at 2.1 trillion cubic feet. Although the flow of gas was not deemed adequate to support an export industry and the limited production of past years was mostly flared, gas production was considered sufficient for the support of local industries. Gazocean of France entered into a joint venture with the Oman Government for the construction of a $400 million ammonia-urea complex, scheduled to produce 2,000 tons of fertilizer per day. Negotiations continued between the Oman Government and interested firms concerning the construction of facilities for the production of liquefied petroleum gas and pipelines for the transport of gas from the oilfields to the industrial areas along the coast.

Oman's first major industrial project outside the oil and gas industry was to be the construction of a new cement works near Muscat. Although the contract was awarded in 1973 to Associated Portland Cement Manufacturers, Ltd. (APCM) (United Kingdom) and Cementia Holding A.G. (Switzerland), the cement plant was still in the planning stages at yearend. Projected annual capacity of the plant was 300,000 tons, which would make Oman the largest producer in the Gulf area and give the country a surplus of cement over domestic requirements. The Oman Portland Cement Company Ltd., owned 49% by APCM and Cementia and 51% by the Oman Government, was formed to manage the cement plant.

Exploration activities by the U.S.-based firm Marshall-Oman, Inc., and the Canadian firm Prospection, Ltd., under a mining concession granted in 1973, uncovered significant copper deposits in the northern Oman Mountains. Estimated reserves were 11 million tons grading 2.25% copper. At yearend 1975, the Oman Government was actively considering the development of three mines west of Sohar and the construction of associated processing facilities, including possibly a copper smelter.

PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

In 1975, the mineral industry of the People's Democratic Republic of Yemen was limited to the production of salt and the refining of imported crude petroleum. However, the Government embarked on a program during the year, to diversify the mineral sector by issuing tenders for the exploration and development of oil and other mineral resources.

In advertising for foreign oil companies to submit bids for oil exploration in the country, the Petroleum and Minerals Board offered a production-sharing arrangement on the basis of the first 40% of output for the foreign enterprise and the division of the remaining 60% in the proportion of 12% for the company and 48% for the Government. The most promising open zone for oil exploration was a 37,000-square-kilometer area in the eastern Thamud region. At yearend, the Soviet firm Technoexport was awarded a contract for oil exploration and development in 10,000 square kilometers of the Thamud area. A Canadian firm, Siebens Oil and Gas Ltd., contracted for oil exploration rights in the southern part of Socotra Island and its offshore for a 6-year period. In addition, the South Yemeni Algerian Petroleum Company (SYAPCO), owned 49% by the Algerian firm SONATRACH and 51% by the Yemen National Oil Co., was to continue its prospecting activities in the Hadramaut area in the central part of the country.

Another tender was issued for mineral exploration in selected areas, including Maahir-Ghabar, 50 kilometers southwest of

Mukalla, and Wadi Ghabar. Previous geological studies indicated the existence of copper, silver, gold, titanium, and zircon deposits in these zones. In July, the United Arab Emirates concluded a financing agreement with the People's Democratic Republic of Yemen Government for a large-scale mineral exploration program. The extensive surveying and prospecting project was to be conducted under the aegis of the Petroleum and Minerals Board over a 2-year period. At yearend, discussions were being held between the Petroleum and Minerals Board and a number of foreign firms regarding execution of the project.

The nation's sole refinery was located in Aden and operated by British Petroleum Refinery Ltd., (Aden). The refinery, capacity of which was reported at 160,000 barrels per day, processed crude imported from other countries, principally Iran, Kuwait, and Egypt. Domestic petroleum consumption in 1975 was estimated at 1,600 barrels per days; the balance of refinery output was exported. Salt production, which was centered at Khawr Maksoir under the direction of the State-owned General Salt Organization, was chiefly for local consumption.

The reopening of the Suez Canal in June 1975 was expected to greatly increase shipping activity at the port of Aden and to make it once again a major contributor to government revenues. After the closure of the canal in 1967, the number of ships entering the port, the primary function of which was bunkering oil tankers, fell from a yearly average of 6,000 to 3,000. In anticipation of increased shipping traffic at Aden, the Government initiated a renovation and improvement program, including redredging the harbor to a depth of 41 feet, adding underwater anchorages, and modernizing the port's loading equipment. Two international consulting agencies were also contracted with to prepare long-range development plans for expanding the port. Cost of the complete renovation program was estimated at $17.4 million, to be financed in part by a $13.5 million loan from the Arab Fund for Economic and Social Development.

Table 5.—People's Democratic Republic of Yemen: Foreign trade in crude petroleum and petroleum refinery products

(Thousand 42-gallon barrels)

Commodity	1973	1974	1975 e
EXPORTS AND REEXPORTS			
Petroleum refinery products:			
Gasoline	3,369	3,720	1,320
Jet fuel	2,377	1,889	1,100
Kerosine	1,160	1,071	733
Distillate fuel oil	3,530	3,788	1,270
Residual fuel oil	10,090	6,890	3,522
Other	42	30	429
Total	20,568	17,388	8,374
BUNKER LOADINGS			
Petroleum refinery products:			
Distillate fuel oil	NA	404	NA
Residual fuel oil	NA	1,104	NA
Total	NA	1,508	NA
IMPORTS			
Petroleum, crude	22,257	19,930	12,150
Petroleum refinery products:			
Gasoline	254	617	520
Jet fuel and kerosine	50	303	240
Distillate fuel oil	1,425	598	498
Residual fuel oil	304	34	--
Lubricants	14	--	3
Other	--	--	210
Total	2,047	1,552	1,471

NA Not available.

QATAR

Qatar's substantial oil revenues in 1975 provided for continued economic growth and financed the Government's numerous industrial projects. Qatar's planned industrialization program included the construction of an oil refinery, natural gas processing facilities, a direct-reduction steel mill, and a petrochemical complex, as well as the expansion of the country's existing refinery and cement and fertilizer plants. Qatar's petroleum income soared to $1,700 million[6] in 1974, compared with $400 million in 1973, and reached $1,850 million in 1975 despite decreased oil production. The oil sector accounted for more than 52% of the GNP of $3,517 million in 1975, and provided well over 90% of government revenues.

During 1975, the Qatar Government was in the process of negotiating a 100% takeover of the two oil companies operating in Qatar, the Qatar Petroleum Co., Ltd. (QPC) and Shell Oil Co. of Qatar (Shell). The Qatar General Petroleum Organization (QGPO) was formed in 1974 to administer the Government's 60% share in both these ventures as well as its equity in all other petroleum related industries. The Royal Dutch/Shell Group and the Italian firm Ente Nazionale Idrocarburi held the remaining 40% equity in the Shell concession. QPC's remaining shares were held by British Petroleum (BP) (9.5%), Royal Dutch/Shell (9.5%), Compagnie Française des Pétroles (9.5%), Near East Development (9.5%), and Portuguese Participations and Explorations Corporation (2%). The conditions of the Government's 100% acquisition, which was expected to provide for management contracts for the concessionary companies, were to be finalized by mid-1976.

In an attempt to conserve oil resources, Qatar began in 1975 to moderate the pace of petroleum development and production. Crude output in 1975 totaled 159,482,000 barrels, a decrease of 16% from the 1974 level of 189,348,000 barrels. Production from Qatar's three offshore oilfields operated by Shell was at the rate of 260,000 barrels per day and accounted for over one-half of Qatar's overall production. The two major offshore fields, Bul Hanine and Maydan-Mahzan, produced about equally over 75% of the total offshore output. They were linked by pipeline to storage and loading facilities on Halul Island, which also served Shell's first-discovered (1960) smaller field, Idd el Shargi. QPC operated the onshore Dukhan Field, which averaged 176,936 barrels per day in 1975. Crude oil reserves in Qatar were estimated at 6 billion barrels.

An imminent addition to Qatar's producing fields was El Bunduq, an offshore discovery which straddled the Qatar/Abu Dhabi median line 23 kilometers northwest of Das Island. Startup was scheduled for early 1976 at an initial rate of 30,000 barrels per day. Crude output was to be transported via a 27-kilometer pipeline to the Abu Dhabi Marine Areas (ADMA) export terminal on Das Island, with the major part of production destined for Japan. Owned jointly by BP, Compagnie Française des Pétroles, and United Petroleum Developments of Japan, El Bunduq was under ADMA management. State revenue from the field was to be shared equally by Qatar and Abu Dhabi.

Qatar's petroleum exports in 1975 totaled 156,605,664 barrels, or about 98% of total crude production. Petroleum export earnings were approximately $1,700 million and accounted for over 97% of all export revenues. The remainder of crude production was used to fuel electric power and water desalination facilities and as feed for Qatar's oil refinery at Umm Said. In 1975, plans were made for the expansion of the 7,500-barrel-per-day refinery to a capacity of 30,000 barrels per day in light of growing domestic requirements. At the same time, the Qatar Government contracted Universal Oil Products Management Services to carry out a market survey and feasibility study for a second oil refinery with a capacity in the 80,000- to 90,000-barrel-per-day range.

Qatar's natural gas reserves, mostly associated with oil, were estimated at 7.5 trillion cubic feet. However, a new nonassociated gasfield discovered in 1974 off the northeast tip of the Qatar peninsula was expected to make a substantial addition to Qatar's reserves. Production in 1975 and prior years averaged about 200 billion

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[6] Where necessary, values have been converted from Qatar riyals (QR) to U.S. dollars at the rate of QR3.95=US$1.00.

feet of gas, most of which was flared. Beginning in 1974, gas from Dukhan Field was transported by a 97-kilometer pipeline to QPC's new NGL facility at Umm Said. Production of gas liquids in 1975 totaled 2,149,697 barrels, including 1,002,566 barrels of propane, 701,333 barrels of butane, and 445,798 barrels of natural gasoline. Qatar began exporting natural gas liquids in January 1975, with exports for the year totaling 1,867,397 barrels.

The Qatar Gas Co. (QGC), a joint venture between the Qatar Government (70%) and Shell International Gas, Ltd. (30%), was formed in 1974 to supervise the utilization of offshore associated and nonassociated gas. The new company's first project was to be the construction of a second NGL plant at Umm Said to process gas produced in association with Shell's offshore oilfields. The plant, estimated cost of which was $350 million, was to begin production in 1978 at a rate of 7,700 barrels of propane, 6,300 barrels of butane, and 6,300 barrels of natural gasoline per day. An offshore gas pipeline network was planned in conjunction with the project.

A more ambitious venture under consideration by QGC was the construction of an LNG facility based on the recently discovered major dry gasfield in the Shell offshore concession area. At yearend 1975, Shell was conducting feasibility studies of the proposed LNG plant, which was to be built in the north of the Qatar peninsula at an estimated cost of $1.5 billion.

Associated gas piped from Dukhan Field was also used as feedstock for the Qatar Fertilizer Co. (QAFCO) plant at Umm Said. Controlling equity in the plant, which was brought onstream in 1973, was held by the Qatar Government, with 20% held by Norsk-Hydro (Norway) and 7% by Power-Gas Corp., Ltd. (United Kingdom). In 1975, the Qatar Government awarded a $21 million contract for expansion of the fertilizer facility to John Howard & Co., Ltd., of the United Kingdom and its Qatari partnership, Alattiyah Contracting and Trading Co. The expansion project, which was scheduled for completion in late 1978, was designed to double the plant's capacity to 1,800 tons per day of ammonia and 2,000 tons per day of urea. In 1975, Qatar exported 31,731 tons of ammonia and 148,098 tons of urea to earn about $40 million in foreign exchange.

Another expansion program was designated for Qatar's only cement plant, at Umm Bab on the west coast of the peninsula. Under the direction of the Qatar National Cement Co., the plant's annual capacity was doubled in 1974 to 220,000 tons. The second-stage expansion was to add an extra 100,000 tons per year by mid-1976, and a further 900 tons per day (328,000 tons per year) by yearend 1978. The total estimated cost of the expansion project was $200 million.

Construction began in 1975 on a 400,000-ton-per-year direct-reduction steel mill in the Umm Said industrial area. The plant, scheduled for completion in 1977, was to produce construction steel for both domestic consumption and export. The estimated cost of $200 million was to be allocated among the shareholders of Qatar Steel Co., Ltd. (QASCO), owned 70% by the Qatar Government, 20% by Kobe Steel Ltd., Japan, and 10% by Tokyo Boeki Ltd. of Japan.

The largest of Qatar's industrial projects was the $500 million petrochemical complex under construction at Umm Said. The complex was to consist of an ethylene production plant and a low-density polyethylene unit with annual capacities of 300,000 tons per year and 145,000 tons per year, respectively. The Qatar Petrochemical Co. (QAPCO), owned 80% by the Qatar Government, 15% by Charbonnages de France-Chimie (CDF-Chimie), and 5% by France's Gazocean, was established in 1974 to build, operate, and market the output of the plant. In 1975, QAPCO entered into a second joint venture with CDF-Chimie for the establishment of a $300 million petrochemical plant near Dunkirk in northern France. Owned 40% by QAPCO and 60% by CDF-Chimie, the plant was to produce 450,000 tons of ethylene per year. Both plants were to go onstream in early 1979.

Table 6.—Qatar: Exports of crude oil by destination
(Thousand 42-gallon barrels)

Country	1973	1974	1975
Australia	4,198	3,906	1,789
France	25,514	29,018	11,826
Germany, West	803	5,183	7,446
Italy	24,017	r 20,805	15,659
Netherlands	52,706	5,950	27,375
Philippines	1,314	3,066	--
South Africa, Republic of	22,594	--	--
Sweden	2,920	5,183	511
Thailand	21,024	17,995	10,184
United Kingdom	23,652	35,405	20,002
United States	3,979	621	32,157
Other	25,439	59,200	29,381
Total	208,160	r 186,332	156,330

r Revised.

Source: Organization of the Petroleum Exporting Countries, Statistics Unit. Annual Statistical Bulletin 1975, Vienna 1976, p. 70.

Table 7.—Qatar: Imports of petroleum refinery products
(Thousand 42-gallon barrels)

Product	1973 e	1974 e	1975
Gasoline	340	369	41
Jet fuel and kerosine	40	158	139
Distillate fuel oil	290	405	--
Lubricants	25	14	34
Other	30	147	181
Total	725	1,093	395

e Estimate.

SYRIA

Increased petroleum production and higher prices for petroleum exports in 1975 contributed to continued economic expansion in Syria and accounted in large part for the real increase in the gross domestic product (GDP) from $1.9 billion[7] to $2.5 billion since the 1973 Arab-Israeli conflict. The emphasis in 1975 was again placed on the petroleum sector, when, as part of a newly adopted policy, Syria invited Western firms to participate in its plans for increasing oil exploration, development, and production. Having opened 11 onshore tracts and 1 offshore tract for petroleum exploration, the Syrian Government signed three foreign contracts. One was with a U.S. consortium consisting of TRIPCO Petroleum Co., American Express, Reserve Oil & Gas Co., and City Investing Co. The production-sharing agreement granted the U.S. group prospecting rights in a 4,500-square-kilometer offshore area for 6 years. The other contracts were acquired by the Romanian firm Rompetrol, for an exploration tract in northeastern Syria, and the Hungarian firm Chemokomplex, for a tract in the central part of the country. Syria invited foreign bids for the investigation and development of mineral potential in other areas, principally phosphate rock, natural gas, sulfur, iron ore, and rock salt. Syria's mineral production in 1975 is reported in table 1.

In 1975, petroleum production in Syria reached 65.9 million barrels, a substantial increase over the modest initial production rate of 10 million barrels in 1968. The Karatchuk, Rumailan, and Suwaidiyah Fields, all in Syria's extreme northeast corner, were the source of the bulk of the crude production. A small portion was derived from the Djubissa Field, also in northeast Syria, which was opened in May 1975 at an initial rate of 5,000 barrels per day. The reserves of the new field were

[7] Where necessary, values have been converted from Syrian pounds (£S) to U.S. dollars at the rate of £S3.65 = US$1.00.

estimated at 130 million barrels of oil, which, in contrast to the heavier, high-sulfur crudes of the three older fields, was found to be both lighter (40° API gravity) and lower in sulfur content (0.62%). The added production from the Djubissa Field, which was to be greatly expanded in its second stage of development, was expected to increase Syria's crude output to the minimum rate required for membership in the Organization of Petroleum Exporting Countries (OPEC). In 1975, earnings from petroleum exports, which accounted for the major part of Syria's oil production, were approximately $451 million. A 60-kilometer spur line, with a throughput capacity of 21 million barrels per year, connected the new Djubissa Field with the main pipeline running from the northeastern fields to the Mediterranean port of Tartus.

The remainder of Syria's crude production was transferred to the refinery at Homs, located just north of the Lebanon border, and was combined with lighter Kirkuk crude from Iraq in a mixture of 20% Syrian and 80% Iraqi crude. The Homs facility was virtually destroyed during the Arab-Israeli conflict in 1973 but was rebuilt to attain a capacity of approximately 2.5 million tons per year. Refinery output increased 29% in 1975 to total 2,284,000 tons, which included 827,000 tons of fuel oil, 629,000 tons of gas oil, 374,000 tons of kerosine, and 343,000 tons of gasoline. Secondary refinery products and refinery losses made up the balance of output. This production covered three-fourths of Syria's domestic comsumption, which in 1975 was 3.1 million tons, including 1.8 million tons of residual fuel oil.

The Homs refinery was to be further expanded to a 5-million-ton yearly capacity by the addition of two distillation units under contracts to the Czechoslovak firm Technoexport and the Italian firm Ingeco S.p.A. of Milan. In July, the Banias Oil Refinery Co. was created with a capital of $420 million to undertake the management of a new state-owned refinery in the port city, which was slated for completion by yearend 1977. Constructed by Romania's Industrial Export Organization, the plant was to add an annual capacity of 6 million tons to Syria's refining operations, with the feed again a blend of heavier domestic oil and lighter Iraqi crude.

Revenue obtained from petroleum production and processing was supplemented by transit fees levied on Iraqi and Saudi Arabian crude transported via pipeline en route to Mediterranean ports. In 1975, Syria's transit revenues were reported at approximately $150 million, compared with $164 million in 1974. The relative decrease was due to the suspension of Lebanon operations in February 1975 by TAPline, which traversed a 127-kilometer stretch of southern Syria in carrying Saudi Arabian crude to the Sidon port in Lebanon. The bulk of Syria's transit income was earned on crude carried in the pipelines of the INOC to the ports of Banias in Syria and Tripoli in Lebanon. In 1975, the shipments of Iraqi crude averaged nearly 893,000 barrels per day. However, the agreement under which Iraq transported crude to the two Mediterranean outlets as well as to Syria's Homs refinery expired in December 1975 amidst a dispute regarding transit rates and the price of crude. The financial provisions, which had provided for Syria to purchase Iraqi crude oil at $3.05 per barrel in addition to collecting a 45-cent-per-barrel transit fee, were under negotiation at yearend.

The production of phosphate, Syria's other major mineral commodity, increased from 603,000 tons in 1974 to 857,000 tons in 1975 but fell short of the Government's goal of 1.3 million tons. Production was concentrated at Syria's three principal phosphate mines, all in the central part of the country, approximately 50 kilometers south of Palmyra and 160 kilometers southeast of Homs. Combined reserves at the Khunaifis mine, developed by the Romanian firm Industrial Export, and the al Sharqiyah mines A and B, developed respectively by Centrozap of Poland and Technoexport of Bulgaria, were estimated at 500 million tons. Most of the phosphate production in 1975 was trucked to the port of Tartus for export, earning approximately $8.6 million in foreign exchange; the remainder was feed for the Homs fertilizer plant. In support of phosphate exports, Syria has undertaken the construction of a 240-kilometer railway, to be completed by 1978 linking the phosphate deposits and the Mediterranean port.

Plans were announced in 1975 to supplement Syria's only existing nitrogen fertilizer plant at Homs, the output of which totaled 90,000 tons in 1975, with a second nitrogen facility to be built by the French company Creusot-Loire. Homs was also designated as the site for a large ammonia urea plant based on a 1,000-ton-per-day ammonia unit, which was to be financed by development loans from Saudi Arabia. In addition, a contract was granted in February 1975 to the Romanian firm Industrial Export for the erection of a 1,400-ton-per-day triple superphosphate plant, also in the Homs area. The contract, which was valued at $180 million, provided for a construction period of 35 months from the effective date of the agreement and for the Romanian contractor to assist in the operation of the plant during an initial 1-year period.

The diversification and expansion of Syria's mineral sector was provided for by investments made in 1975 in aluminum, steel, and cement operations. As part of the planned erection of an integrated continuous casting and aluminum rolling complex at Latakia, a contract was signed with Segim Company of France for the construction of a rolling mill scheduled for startup in mid-1976. Cement production was to be increased by the addition of two new production units, each with a capacity of 1,600 tons per day, at the Tartus cement plant, and by the construction of a new cement plant with a capacity of 3,000 tons per day in the northwestern city of Aleppo. The East German firm Investexport contracted for the expansion of the Tartus facility, while the Romanian firm Usine Export-Import concluded a $110 million agreement with the Syrian Government for the new plant. In addition, plans were made to expand, with Polish aid, the steel plant located in Hama by the installation of a 100,000-ton-per-year light-section rolling mill.

In November 1975, a new railway was inaugurated linking Qamishli in northeast Syria near the Iraqi border and the port city of Latakia. The port at Latakia was to undergo a substantial expansion program, including the construction of additional piers with a total length of 2,400 meters, the deepening of the harbor to accommodate ships of up to 50,000 tons, and an increase in storage capacity from 1.6 million to 3 million tons. Syria's other main export terminals, Tartus and Banias, were also slated for further extensions, and the improvements to all three port facilities were to be accomplished by yearend 1978.

UNITED ARAB EMIRATES

The oil sector was the most significant source of income in 1975 to the United Arab Emirates, formed in 1971 of seven former Trucial Coast sheikdoms. Petroleum revenue of the three oil-producing emirates —Abu Dhabi, Dubai, and Sharjah— amounted to about $4.8 billion.[8] Abu Dhabi, which held the presidency of the United Arab Emirates, was by far the largest oil producer and the only United Arab Emirates member of OPEC. The other four members of the federation—Ajman, Fujairah, Ras al-Khaimah, and Umm al-Qaiwain —each had awarded exploration licenses to foreign concessions. (See table 9).

Although united politically, the individual emirates exercised independent control over their budgets and oil receipts. The rapidly expanding incomes of Abu Dhabi, Dubai, and Sharjah prompted these emirates to embark on numerous development projects, centered primarily around the use of their massive oil and natural gas reserves. To stimulate investment in the nonoil-producing emirates, the United Arab Emirates Government established a development bank to provide loans and financing for both petroleum- and nonpetroleum-related projects. In 1975, the Government contracted Hunting Geology and Geophysics Ltd. (United Kingdom) to conduct a comprehensive survey of the mineral potential of the emirates of Dubai, Sharjah, Ajman, Fujairah, Ras al-Khaimah, and Umm al-Qaiwain. Aerial photography, airborne magnetometry, gamma-ray spectrometry, and satellite studies were to be used in the exploration for both metallic and industrial minerals and in the preparation of geologic maps. The study was to cover 11,500 square kilometers of United Arab Emirates territory and to be completed in 16 months.

[8] Where necessary, values have been converted from United Arab Emirates Dirhams (UAED) to U.S. dollars at the rate of UAED3.95= US$1.00.

Table 8.—Oilfields of the United Arab Emirates, 1975

Location	Oilfield and discovery date	Company	Date of first production	Rate of production (average barrels per day)	Reserves (million barrels)	Gravity (°API)	Sulfur content (percent)
Abu Dhabi:							
Onshore	Asab, 1964	Abu Dhabi Petroleum Co., Ltd	1973	327,800	1,000	40.0	0.7
Do	Bab, 1960	do	1963	81,900	1,000	39.0	.7
Do	Bu Hasa, 1960	do	1962	481,900	1,200	40.0	.7
Do	Sahil, 1970	do	1975	5,000	NA	NA	.7
Offshore	Abu Al Bu Koosh, 1973	Abu Al Bu Koosh Oil Co., Ltd	1974	66,000	280	32.1	1.7
Do	Arzanah, 1973	Amerada Hess Corp	--	--	NA	45.0	1.0
Do	El Bunduq, 1964	El Bunduq Co	--	--	800	38.5	1.1
Do	Mubarraz, 1969	Abu Dhabi Oil Co., Ltd	1973	20,000	2,000	38.1	.9
Do	Umm Shaif, 1958	Abu Dhabi Marine Areas, Ltd	1962	178,700	1,800	37.6	1.4
Do	Zakum, 1964	do	1967	242,800	1,400	40.1	1.0
Dubai:							
Offshore	Fateh, 1966	Dubai Marine Areas, Ltd	1969	149,000	1,400	31.6	1.7
Do	Southwest Fateh, 1970	do	1972	102,000	1,000	32.5	1.7
Do	Rashid, 1973	do	--	--	NA	37–40	NA
Sharjah:							
Onshore	Mubarek, 1972	Crescent Petroleum Co	1974	38,000	500	37.0	.6

NA Not available.

Table 9.—Concessions held in the United Arab Emirates during 1975

Location	Company	Ownership (percent)	Nationality of company	Area (square kilometers)
Abu Dhabi:				
Onshore	Abu Dhabi Petroleum Co., Ltd. (ADPC) operator:			
	Abu Dhabi National Oil Co. (ADNOC)	60.00	United Arab Emirates	
	British Petroleum Co., Ltd. (BP)	9.50	United Kingdom	
	Compagnie Française des Pêtroles (CFP)	9.50	France	
	Near East Development Corp.:			
	Exxon Corp. (Exxon)	4.75	United States	
	Mobil Oil Corp. (Mobil)	4.75	do	40,000
	Shell International Petroleum Co., Ltd. (Shell)	9.50	United Kingdom and Netherlands.	
	Portugese Participations and Explorations Corp. (Partex)	2.00	Portugal	
Offshore	Abu Al Bu Koosh Oil Co., Ltd:			
	CFP operator	51.00	France	
	New England Petroleum Co. (NEPCO)	24.50	United States	109
	Armerada Hess Corp	12.25	do	
	Sunningdale Oils Ltd	12.25	Canada	
Do	Abu Dhabi Gas Liqueaction Co., Ltd. (ADGLC):			
	ADNOC	51.00	United Arab Emirates	
	BP	16.30	United Kingdom	
	CFP	8.20	France	30,080
	Mitsui & Co., Ltd	22.10	Japan	
	Bridgestone Liquefied Gas Co., Ltd	2.40	do	
Do	Abu Dhabi Marine Areas Ltd. (ADMA) operator:			
	ADNOC	60.00	United Arab Emirates	
	BP	14.67	United Kingdom	31,080
	CFP	13.33	France	
	Japan Oil Development Co., Ltd. (JODC)	12.00	Japan	
Do	Abu Dhabi Oil Co., Ltd. (ADOC):			
	ADNOC	51.00	United Arab Emirates	
	Maruzen Oil Co., Ltd		Japan	
	Daikyo Oil Co., Ltd	49.00	do	4,416
	Nippon Mining Co., Ltd		do	
Do	Amerada Hess Corp. of Abu Dhabi operator:			
	Amerada Hess Corp	31.50	United States	
	Pan Ocean Oil Corp	31.50	United Kingdom	
	Bow Valley Industries Ltd	20.00	Canada	NA
	Wingate Enterprises	12.00	United Kingdom	
	Houston Oil Canada	5.00	Canada	
Do	El Bunduq Co. (ADMA operator):			
	BP	33.33	United Kingdom	
	CFP	33.33	France	NA
	United Petroleum Development Co., Ltd	33.33	Japan	
Do	Sunningdale Oils Ltd	100.00	Canada	2,820

See footnote at end of table.

Table 9.—Concessions held in the United Arab Emirates during 1975—Continued

Location	Company	Ownership (percent)	Nationality of company	Area (square kilometers)
Ajman:				
Offshore	Occidental Petroleum Corp	100.00	United States	NA
Dubai:				
Onshore	Texas Pacific Dubai Inc. (Distillers Corp. Seagram, Ltd.):	50.00	do	
	Union Texas Dubai Inc	25.00	do	
	Louisiana Land and Exploration Co. (LL & E)	12.50	do	4,177
	Quintana Dubai Inc	7.50	do	
	Natomas of Dubai Inc	5.00	do	
Offshore	Dubai Petroleum Co. (DPC):			
	Continental Oil Co. (CONOCO operator)	30.00	do	
	Dubai Marine Areas Ltd. (DUMA):			
	CFP	25.00	France	
	Hispanico de Petroleos, S.A. (Hispanoil)	25.00	Spain	3,360
	Deutsche Texaco A.G. (Texaco)	10.00	United States	
	Dubai Sun Oil Co. (Sun)	5.00	do	
	Delfzee Dubai Petroleum NV (Wintershall AG)	5.00	West Germany	
Do	Sunningdale Oils Ltd	100.00	Canada	3,360
Do	Texas Pacific Dubai Inc. (Distillers Corp. Seagram, Ltd.):	50.00	Untied States	
	Union Texas Dubai, Inc	25.00	do	
	LL & E	12.50	do	2,020
	Quintana Dubai Inc	7.50	do	
	Natomas of Dubai, Inc. (Natomas Co.)	5.00	do	
Fujairah:				
Offshore	Reserve Oil and Gas Co	100.00	United States	1,500
Ras al-Khaimah:				
Onshore	Norsk Hydro A.S	85.00	Norway	1,700
	Peninsula Petroleum Ltd	15.00	United States	
Offshore	Vitol Exploration B.V. (operator):	25.00	Netherlands	
	Weeks Natural Resources Ltd	25.00	United Kingdom	
	Societa Italiana Resina (SIR)	20.00	Italy	
	Deutsche Schachtbau und Tiefbohrgesellschaft m.b.H. (DST)	10.00	West Germany	2,330
	Asamera Oil Corp. Ltd	6.00	Canada	
	Canadian Superior Oil Ltd	6.00	do	
	United Refining Co	6.00	United States	
	Kewanee Oil Co	2.00	do	
Sharjah:				
Onshore	Crystal Oil Co. (operator):	65.00	do	
	Norsk Hydro AS	30.00	Norway	1,400
	Sogedip	5.00	France	

Offshore	Crescent Petroleum Co.:			
	Buttes Oil and Gas Co. (Buttes) operator	25.70	United States	2,020
	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	
Do	Reserve Oil and Gas Co	100.00	do	1,500
Umm al-Qaiwain:				
Offshore	Zapata Exploration Co. operator:	7.50	United States	1,200
	Canadian Superior Oil Ltd	25.00	Canada	
	Asamera Oil Corp., Ltd	20.00	do	
	United Refining Co	20.00	United States	
	Kewanee Oil Co	10.00	do	
	Gulf Oil Co	7.50	do	
	Anadarko Production Co	10.00	do	
Do	Occidental Petroleum Corp	100.00	do	NA
Do	United Refining Co	100.00	do	NA

NA Not available.

Abu Dhabi.—Abu Dhabi was the United Arab Emirate's largest petroleum producer in 1975 with a flow of approximately 1.4 million barrels per day from both onshore and offshore fields. Although the Government announced its intention of acquiring 100% ownership in ongoing oil operations, this action was postponed indefinitely at yearend. The Government-owned Abu Dhabi National Oil Co. (ADNOC) retained its 60% participation in the major oil operations, as well as its 100% control of natural gas reserves. However, owing to ADNOC's increasing marketing experience and ability, Abu Dhabi did conclude new marketing arrangements with its operating oil companies for 1976. In 1975, the production split was 40% equity, 40% buyback, and 20% state crude; in 1976, equity would remain at 40%, but buyback was to be cut to 30%, with ADNOC taking the remaining 30% of crude production.

Onshore, the Abu Dhabi Petroleum Co. Ltd. (ADPC) continued development drilling and the construction of extensive water injection projects in its three main oilfields, which had a combined output of about 891,000 barrels per day in 1975. A water injection scheme, operating at the rate of 500,000 barrels of water per day, was commissioned in Bu Hasa; a similar but larger scheme in Asab was partly installed, with final completion due in early 1976. The Asab, Bu Hasa, and Bab Fields were linked by pipeline to the Jebel Dhanna terminal on the coast. In addition, the new Sahil Field was brought onstream in mid-1975 at an initial rate of 5,000 barrels per day, and development drilling was in progress to raise output capacity to 20,000 barrels per day in 1976. ADPC's total production in 1975 was about 327 million barrels, or 64% of Abu Dhabi's annual output.

Offshore, Abu Dhabi Marine Areas Ltd. (ADMA) was the operator for Abu Dhabi's two major fields, Umm Shaif and Zakum, which averaged 421,500 barrels per day in 1975. These two fields, linked by pipeline to the Das Island terminal, were to undergo a $750 million waterflood and oil production expansion program to ultimately boost production to 1.2 million barrels per day. The offshore area administered by ADMA was the scene of exceptionally high activity during 1975, and the year closed with nine rigs drilling in the 31,080-square-kilometer concession area. Two further oil discoveries were made during the year, at Ghasha 2 and Sateh 1. ADMA's annual output fell about 9% from 169 million barrels in 1974 to 154 million barrels in 1975 owing to cutbacks early in the year.

Abu Dhabi's remaining three active oilfields were all offshore under the ownership of foreign concessionaires. The latest field to come into production (in August 1974) was Abu Al Bu Koosh, which had an output of about 66,000 barrels per day. Operated by a consortium including Sunningdale Oils Ltd., and Amerada Hess Corp., the field was 65 kilometers north of Das Island and constituted as extension of Sassan Field in Iranian waters. The smaller Mubarraz Field, operated by the Japanese consortium Abu Dhabi Oil Co. (ADOC), produced about 20,000 barrels per day. The BP, Compagnie Française des Pétroles, and between Abu Dhabi and Qatar, was scheduled for startup in early 1976 at 30,000 barrels per day capacity. ADMA was the operator for El Bunduq, owned jointly by BP, Compagníe Française des Pétroles, and United Petroleum Development of Japan. Crude was to be piped to Das Island by subsea pipeline, where it was to be processed and stored pending export, primarily to Japanese markets.

Development drilling was continued in the Arzanah Field by Amerada Hess, which projected startup for the field in late 1976. No activity was reported in the only other Abu Dhabi offshore concession, held by Sunningdale Oils. Onshore, the Phillips Petroleum Co. relinquished its 12,943-square-kilometer exploration tract which it had acquired in January 1967.

Progress was made during 1975 on Abu Dhabi's varied projects for the utilization of its petroleum and natural gas resources. The construction of the 15,000-barrel-per-day refinery at Umm al-Nar Island, initiated in 1974, neared completion. The refinery, which was to process crude piped from Abu Dhabi's onshore oilfields, was designed, engineered, and constructed by the Kellog Co. (United States) at a cost of $35 million. It consisted of four major processing units—crude distillation, hydrotreating, catalytic reforming, and gas recovery—for the conversion of crude into 5,280 barrels per day of light distillate, 4,410 barrels per day of diesel oil, and 5,310 barrels per day of reduced crude.

On Das Island, 170 kilometers offshore, the natural gas facility under construction by the Abu Dhabi Gas Liquefaction Co. Ltd. (ADGLIC) was scheduled for startup in the fall of 1976. The plant was built by the Bechtel Corp. (United States) and Chiyoda Chemical Engineering and Construction Co. Ltd. (Japan) under the direction of ADGLIC, in which the State held 51% equity. Designed to utilize 550 million cubic feet per day of associated gas from the offshore Umm Shaif, Zakum, and El Bunduq Fields, the Das Island project's annual production would consist of 2.2 million tons of LNG, 800,000 tons of liquefied petroleum gas (LPG), 220,000 tons of light distillate, and 230,000 tons of pelletized sulfur. Under a 1972 agreement, Tokyo Electric Power Co. Ltd. (TEPCO) of Japan contracted for the plant's annual output of LNG and LPG over a 20-year period at a price slightly under $1 per million Btu. In the course of renegotiation of the TEPCO supply contract in 1975, Abu Dhabi requested an increase in LNG prices which would link rates to current oil prices; the price dispute was not settled by yearend.

Also in 1975, the Abu Dhabi Government decided to implement a scheme to gather and process associated gas from the onshore Bab, Bu Hasa, and Asab oilfields operated by ADPC. Although the project was originally to be a joint venture with ADPC's foreign shareholders, which included BP, Compagnie Française des Pétroles, Shell, Exxon, and Mobil, negotiations reached a deadlock in September owing to the companies' refusal to assume their proportion of the expenses. The construction of the complex at Jebel Dhanna, which was to process 1.3 billion cubic feet of gas per day, was entrusted to the State-owned ADNOC. Output was to consist of approximately 185,000 barrels per day of NGL, in the proportion of 114,000 barrels per day of propane and butane and 71,000 barrels per day of natural gasoline.

Abu Dhabi entered the tanker business in 1975 with the establishment of the Abu Dhabi National Tanker Co. (ADNTC) for the maritime transport of hydrocarbon products. ADNTC, placed under the control of ADNOC, was to be responsible for the purchase, charter, and management of hydrocarbon tankers, as well as for the construction of terminals, storage tanks, and other facilities. In April, the company acquired its first tanker, the 269,000-ton *al-Dhafra,* as the initial step in building a national tanker fleet.

Ajman.—Oil exploration in Ajman proved unsuccessful in 1975, and in the latter part of the year, United Refining Co. (United States) relinquished its onshore and offshore concession areas. The only remaining prospecting rights in the emirate were held by Occidental Petroleum Co., which held claims to adjacent offshore areas in Ajman and Umm al-Qaiwain waters.

Dubai.—In July 1975, Dubai became the first Arab State in the Persian Gulf to negotiate a 100% takeover of its oil and gas industry. Dubai credited the foreign companies operating its two offshore oil- and gasfields, Fateh and Southwest Fateh, with $110 million in compensation for past investment. Equity shares in the Dubai Petroleum Company (DPC) were held 30% by Continental Oil Co., 50% jointly by French CFP and Spanish Hispanoil, 10% by Deutsche Texaco, and 5% each by Sun Oil Co. and German Wintershall. Under the new agreement, the companies were to maintain their responsibility for exploration, production, equipment, and marketing, as well as to provide all financing.

During 1975, DPC continued its waterflood and gas reinjection scheme designed to raise production of the Fateh and Southwest Fateh Fields from 250,000 barrels per day to 400,000 barrels per day in 1976. However, a severe gas blowout and fire occurred in Fateh in July and interrupted the secondary recovery program. Production was restored to 149,000 barrels per day at Fateh and 102,000 barrels per day at Southwest Fateh, but the plan to average over 300,000 barrels per day in late 1975 had to be abandoned. Overall, production increased about 5% over the 1974 output and contributed nearly $700 million to Dubai's revenues.

DPC also had promising prospects in the 1 Rashid wildcat drilled in 1973 about 24 kilometers south of Fateh, which tested oil and gas in significant quantities. Drilling was also in progress by Texas Pacific Dubai Inc., a subsidiary of Distillers Corp.-Seagrams, Ltd. (Canada), in its 2,020-square-kilometer offshore concession area acquired in 1974. The group, whose shareholders included Texas Pacific Dubai (50%), Union Texas Dubai Inc. (25%), Louisiana Land & Water Co. (12.5%), Quintana Dubai Inc. (7.5%), and Natomas of Dubai Inc. (5%), signed a second agreement in 1975 for exploration rights to a 4,177-square-kilometer onshore area.

The Dubai Government announced plans to construct a complete industrial zone city at Jebel Ali, situated about 17 kilometers from the city of Dubai. Among the projects envisaged for the industrial area were an aluminum smelter, a natural gas liquefaction facility, a steel plant, a 200,000-barrel-per-day refinery, and a deepwater port. In April 1975, the Dubai Government contracted British smelter Construction Ltd. (BSCL) for a 1-year feasibility study and subsequent construction of the aluminum smelter at Jebel Ali. Equity in the Dubai Aluminium Co. (DUBAL), formed in 1975, was held 80% by the Dubai Government and 20% by BSCL. Production at the smelter, whose cost was estimated at $300 million, was to begin in 1979 at a capacity of 135,000 tons per year. At yearend, however, details regarding raw material supply, fuel supply, and financing for the project had not been announced.

At the same time, Sunningdale Oils of Canada was contracted by the Dubai Government to extract natural gas liquids from all gas produced in the emirate, which was about 102 million cubic feet per day in 1975. Construction was to begin in May 1976 on a $120 million gas processing plant at Jebel Ali. Sunningdale would also market the output of the plant, which was expected to produce 4 million barrels per year of NGL.

Construction of the Dubai national cement plant by Costain Civil Engineering began in May 1975 and was due for completion in mid-1978. The $50 million plant, located 10 kilometers south of the city of Dubai, was to have a capacity of 500,000 tons per year.

Fujairah.—No mineral production was reported in the emirate of Fujairah in 1975. Petroleum exploration continued offshore by Reserve Oil and Gas Co. (United States), which held a 1,500-square-kilometer concession in the Gulf of Oman off Fujairah's east coast. Seismic surveys were conducted during 1974 and 1975, and exploratory drilling was scheduled for late 1976.

Ras al-Khaimah.—Ras al-Khaimah, the northernmost emirate, had no proven oil reserves despite continued exploration activity in 1975. During the year, participation in the 2,330-square-kilometer offshore concession area held equally by Vitol Exploration B.V. (Netherlands) and Weeks Natural Resources Ltd. (United Kingdom) was broadened to include a multinational group. The new equity allocation was 25% each to Vitol and Weeks, 20% to the Italian firm Société Italiana Resine (SIR), 10% to the West German Deutsche Schactbau, 6% to United Refining (United States), 6% each to the Canadian firms Canadian Superior and Asamera, and 2% to Kewanee (United States). At yearend, the group was drilling a 1,600-foot exploratory well situated about 39 kilometers east of Sharjah's Mubarek Field off Abu Musa Island. Onshore, Norsk-Hydro A/S held a 1,700-square-kilometer concession, although no activity was reported.

In February 1975, Ras al-Khaimah awarded a joint venture group, consisting of Contracting and Trading Co. of Lebanon and Archirodon Construction Co. of Greece, a $40 million contract for the construction of a deepwater port at Kohr Kuwait. Consultants to the project were Halcrow Middle East Ltd., an affiliate of the British consulting firm Sir William Halcrow and Partners, Ltd. The contract provided for two berths, both 200 meters long and 12.5 meters deep, to accommodate 20,000-ton cargo vessels, and also for rights to the eventual expansion of the port facilities.

Sharjah.—Although Sharjah's oil production was still minimal compared with that of Abu Dhabi and Dubai, the emirate's crude output expanded rapidly and increased 38% over the 1974 level to reach 38,000 barrels per day in 1975. Production was limited to Sharjah's offshore Mubarek Field, situated in a 2,000-square-kilometer concession area around Abu Musa Island, in territory claimed by Sharjah, Iran, and Umm al-Qaiwain. Pending resolution of the dispute, state revenue from the field was to be allocated among the three parties. The Mubarek concession was operated by the Crescent Petroleum Co., owned 25.7% by Buttes Gas and Oil Co., 25% by Ashland Oil, Co., 25% by Skelly Oil Co., 12.5% by Kerr-McGee, 10% by Cities Service, and 1.8% by Juniper Petroleum.

During 1975, Crescent Petroleum Co. commenced drilling a third development well in the Mubarek Field. No other offshore activity was reported, although Reserve Oil and Gas Co. held exploration rights to a 1,500-square-kilometer area in the Gulf of Oman through a joint arrangement with the emirates of Sharjah and Fujairah. Onshore, the only concession area was held by a consortium consisting of U.S.-owned Crystal Oil Company (65%), Norway's Norsk-Hydro (30%), and France's Sogedip (5%). Crystal completed its seismic work in 1975, and planned to begin drilling its first development well in early 1976.

With its increased oil revenues, Sharjah planned and executed a number of development projects, including a 220,000-ton-per-year cement plant in the capital city. Valued at about $25 million, construction of the plant was by Six Construct of Belgium and under the supervision of Pacific Consultants of Japan. On the Sharjah waterfront, the first two phases of a new deepwater harbor designed and supervised by Sir William Halcrow and Partners, Ltd., was under construction by ARCHOSI, a consortium consisting of Archirodon S.A. of Greece, Hochtief AG of West Germany, and Six Construct of Belgium. The project, valued at $48 million, was initially to provide for seven deep water berths and over 4 kilometers of breakwaters. A third phase would allow the harbor to be expanded to 11 berths plus facilities for 1 tanker.

Umm al-Qaiwain.—Petroleum exploration was the only mineral activity in the emirate of Umm al-Qaiwain during 1975. The Umm al-Qaiwain Oil Group, with Zapata Exploration Co., (United States) acting as operator, began drilling at year-end in its 1,200-square-kilometer offshore concession area. Participation in the United States–Canadian consortium was altered during the year, with shares held 7.5% by Zapata, 25% by Canadian Superior, 20% by United Refining Co., 20% by Asamera Oil Corp., 10% by Kewanee Oil Co., 10% by Gulf Oil, and 7.5% by Andarko Production Co.

Table 10.—Abu Dhabi: Exports of crude oil by destination

(Thousand 42-gallon barrels)

Country	1973	1974 [1]	1975
Canada	9,052	r 6,315	7,154
France	97,200	112,530	84,972
Germany, West	20,148	r 33,763	14,564
Italy	21,718	r 9,965	7,373
Japan	174,470	189,143	106,142
Netherlands	21,973	16,571	72,124
United Kingdom	53,728	44,384	52,268
United States	42,304	r 44,713	35,588
Other	31,498	r 61,099	119,427
Total	472,091	r 518,483	499,612

r Revised.
[1] Based on data for 11 months only.

Source: Organization of the Petroleum Exporting Countries, Statistics Unit. Annual Statistical Bulletin, 1975. Vienna 1976, p. 72.

YEMEN ARAB REPUBLIC

The mineral industry of the Yemen Arab Republic played a minor role in the economy of the country, with mineral activities in 1975 limited to the manufacture of cement, the mining of small quantities of salt, and ongoing oil exploration. The Yemen Arab Republic's economy continued to evidence a substantial trade deficit, which in 1975 reached $200 million,[9] although this was offset by remittances from Yemenis working abroad and growing foreign economic assistance. During the year, the Yemen Arab Republic received increased loans and grants from the Arab countries, channeled both bilaterally, such

[9] Where necessary, values have been converted from Yemen rials (YR) to U.S. dollars at the rate of YR4.5=US$1.00.

as budget subsidization from Saudi Arabia estimated at $500 million, and multilaterally, in the form of numerous project loans from the Arab Fund for Economic and Social Development. Although preliminary mineral surveys of selected areas of the Yemen Arab Republic were being conducted by the United Kingdom and the U.S. Geological Survey, in 1975 Abu Dhabi offered to underwrite the cost of a comprehensive surveying and prospecting program of the country's mineral potential.

Owing to a large-scale expansion program at the port of Salif, funded by the Kuwait Fund for Arab Economic Development, the export of salt by the Yemen Arab Republic was suspended for the most part in 1973. Prior to that time, yearly exports of rock salt mined at open pit operations at Salif averaged 70,000 tons. The modern salt-handling facilities under construction at Salif were expected to increase the port's export potential to between 500,000 and 1 million tons per year, although foreign markets for these quantities were yet to be procured. The resumption of large-scale salt production was scheduled for late 1976.

The capacity of the Soviet-built cement plant at Bajil, northwest of Hodeida port, was 50,000 tons per year, though the plant was reported as operating at less than capacity since its construction in 1972. Most of the Yemen Arab Republic's cement needs continued to be supplied by imports. Plans were being discussed to expand the Bajil facility and build a second cement plant in the Hodeida area, but no arrangements had been finalized at yearend.

No oil was produced in the Yemen Arab Republic, although concessions were awarded in 1974 for exploration rights in the Red Sea and on the coastal Tihama plain. Royal Dutch/Shell announced that it would start exploration drilling in early 1976 in its 10,000-square-kilometer offshore concession in the Red Sea. However, a joint Japanese-United States venture, consisting of Sante Fe Minerals, Inc., and Toyo Menkakaisha Ltd., announced in the late 1975 its intention to abandon further attempts to locate petroleum and/or natural gas deposits in its Red Sea and Tihama concession areas. The company cited prohibitive cost factors and the lack of commercial quantities of crude in the offshore as prompting the decision to shut down its Yemen Arab Republic's operations.

During 1975, as in previous years, all domestic petroleum product requirements were met through imports under an agreement with the Shell Oil Co. The products were refined at the BP refinery at Aden in the People's Democratic Republic of Yemen and were shipped to the ports of Hodeida and Mokha on a biweekly basis. At yearend, however, the Yemen National Petroleum Co., which controlled product distribution, was negotiating a new agreement with the Kuwait National Oil Co. in regard to providing the Yemen Arab Republic's refined petroleum needs. In 1975, petroleum product imports were estimated as follows, in thousand barrels:

Motor gasoline	674
Kerosine	368
Jet fuel	67
Diesel oil	939
Residual fuel oil	211

The Mineral Industry of Other Areas of South America

By Nicholas G. Theofilos [1]

CONTENTS

ECUADOR

Ecuador's gross domestic product (GDP) in 1975 rose 23% at current prices (6% in real terms) despite a decline in the output of the country's key product, crude oil. The downturn in oil-export earnings was due to Ecuadorean oil being overpriced and thus noncompetitive in world markets during the early part of 1975. Also, production was cut back because of breaks in the trans-Andes pipeline and the attaining of full capacity storage at the Balao terminal near Esmeraldas.

The bulk of the crude oil production came from operations of the consortium composed of Corporación Estatal Petrólera Ecuatoriana (CEPE), Texaco, Inc., and Gulf Oil Co., in Oriente Province east of the Andes. After a 15% production decline in this region during 1974, a further 9% decline took place in 1975. Additionally, production from the fields in the Santa Elena Peninsula declined from 2,568 barrels per day in 1974 to 2,278 barrels per day during 1975.

No new major mining operations were brought onstream during 1975. However, following the signing of a concession agreement with the Government, development work started at the La Plata mine to exploit the estimated 180,000-ton reserve of copper, zinc, silver, and gold ore, with a proposed investment of $2.5 million. The project was expected to come onstream by yearend 1976.

Mineral exploration and assessment were carried out by the Dirección General de Geologia Minas (DGGM) in cooperation with foreign technical-assistance missions. A Belgian mission was expected to arrive to assess a porphyry copper deposit discovered by an earlier United Nations mineral survey. A five-man United Kingdom mission was allocated an 8,000-square-kilometer area in the western chain of the Andes for systematic geochemical exploration. Work on about 1,250 square kilometers had been completed and drilling was started on a copper prospect at San Miguel. Exploration for limestone and phosphate rock was also carried out.

In July 1975, Ecuador became the first nation in the Organization of Petroleum Exporting Countries (OPEC) to cut oil prices; it reduced its price 43 cents to $10.12 per barrel. At that time, shipments had dropped to 125,000 barrels per day against an authorized ceiling of 210,000 barrels per day. The price cut was achieved

[1] Foreign minerals specialist, International Data and Analysis.

by lowering the income tax rate to 53.06% from the previous rate of 58.83%, and raising allowable production costs for tax purposes from 45 cents to 51.2 cents per barrel. In addition, the Government raised its authorized production ceiling for the Texaco-Gulf consortium from 210,000 barrels per day to 225,000 barrels per day.

Three exploratory wells were completed during 1975 in the Oriente region, compared with six in 1974. Of the three wells, two were successful field extensions and one was a dry hole. One party-month of geologic work and about 3 party-months of seismic work were completed during 1975. Seismic work was also conducted offshore by both Northwest Pipeline Corp. and CEPE. Northwest signed a contract to drill in an area of 200,000 hectares; drilling was scheduled to begin in mid-1976. Included in the contract signed by Northwest was the requirement that it form a separate company with CEPE for the construction and operatiton of a petrochemical plant and an ammonia-urea plant.

Table 1.—Other Areas of South America: Production of mineral commodities

Area, commodity, and unit of measure	1973	1974	1975 [p]
ECUADOR [1]			
Antimony ....metric tons..	20	--	--
Cadmium, mine output, metal content ....kilograms..	--	573	490
Cement, hydraulic ....thousand metric tons..	485	[e] 500	[e] 500
Clays:			
Bentonite ....metric tons..	20	--	--
Kaolin ....do....	1,068	1,737	2,270
Copper, mine output, metal content ....do....	304	179	239
Gas, natural:			
Gross production ....million cubic feet..	11,477	11,159	10,559
Marketable production ....do....	989	[e] 1,000	[e] 1,100
Gold, mine output, metal content ....troy ounces..	10,420	7,752	8,157
Gypsum (for cement) ....metric tons..	265	480	[e] 500
Iron and steel semimanufactures ....thousand metric tons..	--	33	29
Lead concentrate, metal content ....metric tons..	--	143	119
Natural gas liquids:			
Natural gasoline ....thousand 42-gallon barrels..	117	109	139
Liquefied petroleum gases ....do....	50	63	53
Total ....do....	167	172	192
Petroleum:			
Crude oil ....do....	76.221	63.678	58,753
Refinery products:			
Gasoline ....do....	4,065	4,838	5,680
Jet fuel ....do....	911	960	446
Kerosine ....do....	400	594	1,429
Distillate fuel oil ....do....	2,606	3,113	3,162
Residual fuel oil ....do....	3,013	3,278	3,583
Lubricants ....do....	--	97	127
Other:			
Liquefied petroleum gas ....do....	25	37	50
Unspecified ....do....	186	13	15
Refinery fuel and losses ....do....	672	140	42
Total ....do....	11,878	13,070	14,534
Silver, mine output, metal content ....troy ounces..	56,711	35,277	37,026
Stone, sand and gravel:			
Limestone for cement ....thousand metric tons..	37	40	NA
Quartz ....do....	[r] 5	5	10
Sulfur, all sources [e] ....metric tons..	[r] 1,000	1,000	1,200
Zinc, mine output, metal content ....do....	[e] 54	202	83
FRENCH GUIANA			
Gold, mine output, metal content ....troy ounces..	1,334	1,138	2,437
GUYANA [1]			
Aluminum:			
Bauxite, dry equivalent, gross weight thousand metric tons..	3,276	[e] 3,250	[e] 3,250
Alumina ....do....	259	321	311
Diamond:			
Gem ....thousand carats..	32	[e] 17	[e] 12
Industrial ....do....	21	[e] 12	[e] 8
Total ....do....	53	[2] 29	[2] 20
Gold, mine output, metal content............troy ounces..	7,551	12,239	18,067

See footnotes at end of table.

Table 1.—Other Areas of South America: Production of mineral commodities—Continued

Area, commodity, and unit of measure	1973	1974	1975 p
PARAGUAY			
Cement, hydraulic thousand metric tons	r 74	103	138
Clays:			
Kaolin metric tons	8,000	12,000	12,000
Other thousand metric tons	600	650	780
Gypsum metric tons	10,500	14,600	15,000
Lime do	25,476	27,005	27,707
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	569	431	435
Jet fuel do	64	65	46
Kerosine do	134	125	109
Distillate fuel oil do	655	564	834
Residual fuel oil do	437	462	274
Other, liquefied petroleum gas do	89	75	52
Refinery fuel and losses do	104	69	71
Total do	2,052	1,791	1,821
Pigments, natural, mineral, ocher metric tons	90	110	140
Sand, including glass sand e thousand metric tons	541	601	841
Stone:			
Dimension e do	87	97	108
Crushed and broken:			
Limestone (for cement and lime) do	143	180	265
Other e do	1,400	1,520	2,050
Talc, soapstone, and pyrophyllite metric tons	250	250	120
SURINAM			
Aluminum:			
Bauxite, gross weight thousand metric tons	r 7,110	e 6,706	e 4,928
Alumina do	r 1,429	e 1,179	e 1,143
Metal, primary do	r 55	[1] 54	[1] 26
Cement do	56	43	320
Clays, common e metric tons	3,500	NA	NA
Gold, mine output, metal content troy ounces	r 450	406	141
Sand and gravel:			
Sand:			
Common thousand metric tons	420	250	200
Stone, sand e do	r 3	3	3
Gravel thousand cubic meters	NA	NA	25
Stone, crushed and broken thousand metric tons	r e 50	NA	NA
URUGUAY			
Abrasives, natural corundum metric tons	304	332	417
Aluminum, secondary do	35	42	36
Barite do	--	17	--
Cement, hydraulic thousand metric tons	517	547	637
Clays (unspecified) metric tons	284,822	325,461	310,947
Coke, gashouse do	13,236	13,419	13,152
Feldspar do	205	1,757	1,759
Fluorspar do	96	211	65
Gas, manufactured million cubic feet	906	878	836
Gem stones, semiprecious:			
Agate metric tons	209	207	85
Amethyst do	44	51	6
Iron and steel:			
Iron ore (for cement production) do	3,990	--	--
Steel, crude do	350	192	200
Steel, semimanufactures do	49,762	38,381	42,089
Lime thousand metric tons	48	46	46
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	1,931	2,223	2,243
Jet fuel do	135	143	196
Kerosine do	1,453	1,377	1,420
Distillate fuel oil do	2,869	2,530	3,104
Residual fuel oil do	5,113	5,303	5,478
Lubricants do	1	1	2
Other:			
Liquefied petroleum gas do	291	291	298
Unspecified do	134	172	210
Refinery fuel and losses do	201	174	260
Total do	12,128	12,214	13,211
Sand, common thousand metric tons	1,338	1,598	1,691
Stone:			
Dimension do	[3] 17	15	40
Crushed and broken:			
Alum schist metric tons	--	84	1,546
Dolomite thousand metric tons	24	24	42

See footnotes at end of table.

Table 1.—Other Areas of South America: Production of mineral commodities—Continued

Area, commodity, and unit of measure	1973	1974	1975 p
URUGUAY—Continued			
Stone—Continued			
Crushed and broken—Continued			
Limestone thousand metric tons	900	1,090	1,163
Marble do	4	3	4
Quartz metric tons	1,551	1,505	1,551
Other (including ballast) thousand metric tons	1,807	1,871	1,508
Sulfur e 4 metric tons	r 120	120	2,190
Talc, soapstone, and pyrophyllite do	1,997	2,075	1,268

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] Gem and industrial diamond production are estimated based upon a reported total production.
[3] In addition to this total, the Central Bank of Uruguay reported 63,161 cubic meters of granite as exports.
[4] Recovered from refinery gases.

FRENCH GUIANA

The mineral industry of French Guiana played no significant role in the Nation's economy. Minor quantities of clay, gold, sand, gravel, and crushed stone were produced in 1975.

The only exploration activity during 1975 was for petroleum. An offshore wildcat well was drilled by Entreprise de Recherches et d'Activité's Pétrolières (ERAP), but it was abandoned when basement rock was reached.

GUYANA

Complete nationalization of Guyana's bauxite industry occurred on January 1, 1975, when Reynolds Guyana Mines Ltd. was taken over and operated as Berbice Mines (Bermine). The Government of Guyana originally had agreed to compensate Reynolds for the approximate book value of the company's assets, which amounted to $14.5 million. However, this compensation was reduced to $10 million because of a settlement of claims between the Government and Reynolds regarding income-tax and bauxite-production levies.

The decrease in demand for raw materials by the U.S. aluminum industry caused a decline in actual output of bauxite and alumina during 1975. These lower production rates still remained profitable owing to the higher prices producers were able to obtain, mainly on calcined bauxite. Sales of calcined bauxite were not greatly affected by the widespread drop in demand for ordinary bauxite.

Guyana Bauxite Co. (GUYBAU), the larger of the two national companies, was expected to add 150,000 tons per year to its bauxite-calcining capacity with the construction of a new calcining kiln, which was to be completed by the middle of 1976. As protection against future fluctuations in foreign exchange rates, GUYBAU announced an innovative plan to set payment prices for its worldwide sales of calcined bauxite by using a composite currency unit based on the U.S. dollar, the pound sterling, the West German deutsche mark, and the Swiss franc.[2]

[2] Guyana Bauxite Company Ltd. 1975 Annual Report and Accounts. Pp. 6, 15.

Table 2.—Guyana: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974	Principal destinations, 1974
METALS			
Aluminum:			
Alumina:			
Hydrated	25,401	8,288	All to United States.
Unhydrated	237,602	306,811	Canada 75,577; United Kingdom 70,437; U.S.S.R. 64,069.
Bauxite:			
Dried refractory	15,653	22,200	United States 17,869; United Kingdom 4,331.
Calcined	674,601	779,720	United States 265,119; United Kingdom 120,304; West Germany 78,262.
Other thousand tons	1,673	1,360	Trinidad and Tobago 592; Canada 584; St. Croix 152.
Metals, semimanufactures	4	NA	
Copper metal including alloys, all forms	97	NA	
Gold metal, unworked or partly worked, all forms troy ounces	[1] 1,297	83,013	United Kingdom 81,283.
Iron and steel metal:			
Scrap	5,411	NA	
Semimanufactures	169	548	Trinidad and Tobago 293; Barbados 134.
Lead metal including alloys, all forms	[r] 110	NA	
Platinum-group metals troy ounces	75	NA	
Other, nonferrous scrap metal	132	NA	
NONMETALS			
Clays and clay products (including all refractory brick) value	$14	NA	
Diamond, gem carats	NA	25,954	Barbados 9,111; Belgium-Luxembourg 7,393; Netherlands 5,231.
Precious and semiprecious stones, except diamond do	([2])	48	All to United States.
Sand, not metal bearing	2	NA	
Sodium and potassium compounds, caustic soda	([3])	NA	
Other, crude nonmetallic minerals	([3])	NA	
MINERAL FUELS AND RELATED MATERIALS			
Coal	2	NA	
Petroleum refinery products [4] thousands 42-gallon barrels	([3])	NA	

[r] Revised. NA Not available.
[1] Excludes quantity valued at $2,717.
[2] Excludes quantity valued at $1,470,200.
[3] Less than ½ unit.
[4] Excludes liquefied petroleum gas valued at $2,674 in 1973.

Table 3.—Guyana: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum:		
Alumina	3	NA
Bauxite value	$673	NA
Metal including alloys, all forms	520	NA
Copper:		
Copper sulfate	3	NA
Metal including alloys, all forms	85	NA
Gold metal, worked or partly worked value	$10,404	NA
Iron and steel including alloys, all forms	32,173	282,414
Lead metal including alloys, all forms	200	NA
Manganese ore value	$283	NA
Nickel metal including alloys, all forms	12	NA
Platinum-group metals, unworked and partly worked troy ounces	1	NA
Silver metal, unworked and partly worked do	10,797	NA
Tin metal including alloys, all forms	[r] 75	NA
Zinc metal including alloys, all forms	12	NA
Other:		
Ore and concentrate, gross weight	[r] 32	NA
Metal including alloys, all forms, n.e.s	6	NA
NONMETALS		
Abrasives:		
Crude, natural	4	NA
Grinding and polishing wheels and stones	28	NA

See footnotes at end of table.

Table 3.—Guyana: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1973	1974
NONMETALS—Continued		
Asbestos	9	NA
Barite and witherite	(2)	466
Cement	39,140	39,459
Clays and clay products (including all refractory brick):		
Clays	11	15
Clay products value, thousands	$929	$566
Fertilizer materials:		
Crude, phosphatic	47	NA
Manufactured:		
Nitrogenous	31,035	34,700
Phosphatic	7,795	1,014
Potassic	2,676	60
Other including mixed	658	--
Graphite, natural	r (3)	NA
Gypsum and plasters	NA	463
Lime	14,036	NA
Mica, worked	19	NA
Pigments, mineral, including processed iron oxides	410	NA
Precious and semiprecious stones value	$7,170	NA
Salt	2,483	3,769
Sodium and potassium compounds, n.e.s.:		
Caustic soda	28,680	34,973
Caustic potash, sodic and potassic peroxides	504	NA
Sodium carbonate	291	NA
Sodium sulfate	25	NA
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	1	72
Worked	24	NA
Other stone	981	NA
Gravel and crushed stone	21	NA
Limestone (pulverized)	NA	34,879
Sand, not metal bearing	15	NA
Sulfur:		
Elemental	2	NA
Sulfuric acid	1,002	NA
Other crude minerals	4,175	NA
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	(4)	4,495
Coal	24	NA
Coke	33	NA
Petroleum:		
Crude thousand 42-gallon barrels	(3)	NA
Refinery products:		
Gasoline do	490	381
Kerosine and jet fuel do	151	172
Distillate fuel oil do	1,142	1,123
Residual fuel oil do	2,296	1,819
Lubricants do	37	58
Other:		
Liquefied petroleum gas do	(5)	63
Mineral jelly and wax do	1	--
Asphalt and road oil do	19	--
Unspecified do	(3)	12
Total do	4,136	3,628
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 258	NA

r Revised. NA Not available.
1 Excludes quantity valued at $58.
2 Quantity not available; imports valued at $109.
3 Less than ½ unit.
4 Quantity not available; imports valued at $67.
5 Quantity not available; imports valued at $338,000.

PARAGUAY

In 1975, Paraguay's gross national product (GNP) in real terms increased about 5%, in spite of declining industrial production and continuing poor market conditions for some of its most important exports. The mineral industry played a minor role in the economy of Paraguay. The only mineral commodities of any importance produced were 28,000 tons of lime and 265,000 tons of limestone. Iron ore as well as manganese and copper deposits are believed to exist, but difficulties of transportation contribute to making their development uneconomic.

Cement continued to be the most important mineral product produced. New installations to existing cement plants contributed to an increase of about 34%, bringing cement production to 138,000 tons. A Brazilian company, Camargo Correa Industrial, was evaluating a proposal to build a 1,000-ton-per-day cement plant to supply cement for three planned giant hydroelectric dams—Itaipú, Corpus, and Yacyretá-Apipé.

The interest in petroleum in recent years had not resulted in any discoveries, but exploration activities continued. Texaco Inc., Exxon Corp., Pennzoil Co., and Aminoil, Inc., were prospecting in the Balo Santo area. A 10,000-barrel-per-day refinery at Asuncion was operated by the State-owned Refineria Paraguaya, S.A., which held a refining monopoly.

Table 4.—Paraguay: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal, all forms	77	310
Copper metal, all forms	797	10
Iron and steel, all forms	25,512	24,845
Lead metal, all forms	10	6
Tin metal, all forms	4	22
NONMETALS		
Cement, hydraulic	1,060	NA
Salt	28,165	27,317
Crude minerals and manufactures, not further described	5,845	10,722
MINERAL FUELS AND RELATED MATERIALS		
Asphalt, natural	2,791	3,136
Coal, lignite, briquets and other solid fuels	37	NA
Petroleum:		
Crude oil ... thousand 42-gallon barrels	r 2,191	1,782
Refinery products:		
Distillate fuel oil ... do	r 72	361
Residual fuel oil ... do	r 61	37
Lubricants ... do	39	12
Other ... do	55	74
Total ... do	r 227	484

r Revised. NA Not available.

[1] In addition to the commodities listed individually, Paraguay reports the importation of "precious stones and metals" totaling 1 metric ton (revised) in 1973 and 3 metric tons in 1974.

SURINAM

Surinam achieved its independence on November 25, 1975. The country was expected to undergo a transition from a free-enterprise economy, dependent on large foreign mining companies, to a mixed economy of joint ventures between the Government and private investors, especially in the mining sector.

The bauxite industry has traditionally set the pace of Surinam's economy. Shipments of bauxite decreased drastically in 1975 owing to the worldwide recession, thus eroding the country's balance of trade. Production of bauxite decreased from 6.7 million tons in 1974 to 4.9 million tons in 1975. Two producing companies, Suriname Aluminum Co. (SURALCO), a wholly owned subsidiary of Aluminum Co. of America (Alcoa), and Billiton Maatschappij Suriname, N.V., owned by Royal/Dutch Shell, accounted for about one-third of the GDP. These two firms also accounted for 20% of the gross private investment and for about 90% of commodity exports (by value).

The bauxite deposits in Surinam have never been fully assessed, but known reserves have been estimated sufficient to last 25 years at the current rate of extraction. Total deposits have been calculated to be between 800 million and more than 1,000 million tons.

The Government of Surinam reportedly does not intend to nationalize the present bauxite industry. In joint ventures, the companies are to bring capital and technology to the ventures, and the Government is to contribute the use of public lands, concessionary rights, tax write-offs, and other investment inducements. Eventually, the Government would seek to buy into the bauxite companies with money provided by Netherlands development aid.

An offshore oil exploration program began in 1975, with ELF-Petroleum Surinam drilling a wildcat well that was subsequently abandoned. Esso Standard Oil Co. was to start seismic and geophysical work early in 1976.

Table 5.—Bauxite, alumina, and aluminum shipments from Surinam

(Thousand metric tons)

	1974	1975
BAUXITE		
Suriname Aluminum Co.:		
United States	1,980	947
Europe	98	77
Other	7	--
Total	2,085	1,024
N.V. Billiton Mij.:		
United States	1,234	870
Canada	333	237
Other	114	194
Total	1,681	1,301
Grand total	3,766	2,325
ALUMINA		
Suriname Aluminum Co.:		
United States	260	318
Europe	320	322
Other	--	7
Total	580	647
N.V. Billiton Mij.:		
United States	155	112
Netherlands	264	254
Other	79	77
Total	498	443
Grand total	1,078	1,090
ALUMINUM		
Suriname Aluminum Co.:		
United States	12	7
Europe	28	18
South America	8	1
Other	7	--
Total	55	26

Table 6.—Surinam: Exports of mineral commodities

(Metric tons)

Commodity	1973	1974	Principal destinations, 1974 [1]
Aluminum:			
Bauxite	r 3,666,000	[1] 3,320,140	United States 2,907,000.
Oxide (alumina) and hydroxide	r 1,208,553	[1] 1,111,417	United States 429,430; Norway 289,078; Netherlands 200,641.
Metal including alloys, all forms	r 54,195	[1] 33,816	West Germany 15,582; Italy 6,968; United States 6,902.
Copper metal including alloys, all forms	252	NA	

r Revised. NA Not available.

[1] Compiled from import statistics of selected trading partner countries.

URUGUAY

Despite the adverse world economic conditions, Uruguay's GDP, in real terms, grew almost 4% to $1.8 billion. In 1975, the Government attempted to solve the chronic economic problems by liberalizing foreign trade in the form of realistic foreign exchange rates and a foreign investment law guaranteeing profit repatriation.

The only significant mining activity in Uruguay was in marble quarrying, for which Uruguay is noted, and various construction materials. However, there was considerable interest in the country's iron ore deposits. At Zapucay, in the north, the deposits were believed to contain about 400 million tons of ore with an iron content of over 40%. Also, in the southeastern Departments of Florida and Treinta y Tres, deposits were estimated to contain 100 million tons of ore of 40% iron content.

Lack of coal and oil resources necessitate the development of the country's hydroelectric potential. A joint Argentina-Uruguay venture to build a $400 million hydroelectric plant at Salto Grande was proposed, with partial operation to start in 1979.

Cement plants of the Administración Nacional de Combustibles, Alcohol y Portland (ANCAP) operated at 97% capacity to produce 637,000 tons of cement, which was a record high in production. To meet further demands for cement, especially for the Salto Grande Dam project, ANCAP signed a contract with a South African firm, GATX-FULLER a subsidiary of General American Transportation Corp. of the United States, for $11 million in technology and equipment to expand the Paysandu plant on the Argentine border.

In August 1975, ANCAP announced plans to award to a Uruguayan firm, through competitive bidding, a 5-year contract to take over ANCAP's distribution of gasoline, kerosine, gas-oil, and lubricants. The sale of ANCAP's retail gasoline operations should lead to greater operational efficiency and lower distribution costs.

Uruguay's only refinery, operated by ANCAP, had a capacity of 49,000 barrels per day; all of its crude was imported. Chevron Oil Co. won a contract to explore for oil on the Continental Shelf off the Uruguayan coast, with work scheduled to begin in January 1976. A seismic survey over a 300-kilometer strip in the Santa Lucia basin was to be started by the Argentine State oil company, Yacimientos Petrolíferos Fiscales.

The Mineral Industry of Other South Pacific Islands

By Charlie Wyche[1]

CONTENTS

BRITISH SOLOMON ISLANDS

During 1975, the British Solomon Islands Protectorate (BSIP) reported no new activities in the mineral industry. In 1974, Mitsui Mining & Smelting Co., Ltd., established a joint venture with BSIP to mine about 1.2 million tons of bauxite per year. Bauxite production appeared imminent, but there were no definite indications when it would start.

Gold production, mostly from Guadalcanal, declined slightly compared with that of 1974. Production for the last 5 years follows, in troy ounces:

Year	Quantity
1971	444
1972	200
1973	520
1974	873
1975	803

[1] Physical scientist, International Data and Analysis.

Table 1.—Other South Pacific Islands: Production of mineral commodities

Area and commodity	1973	1974	1975 p
BRITISH SOLOMON ISLANDS [1]			
Gold troy ounces	963	873	804
Silver do	100	--	--
CHRISTMAS ISLAND [1]			
Phosphate rock (shipments) thousand metric tons	1,493	1,809	1,343
FIJI ISLANDS			
Cement, hydraulic metric tons	91,445	85,348	73,200
Gold, mine output, metal content troy ounces	79,983	68,890	68,744
Lime metric tons	3,153	--	2,826
Silver, mine output, metal content troy ounces	29,530	27,101	26,462
Stone, sand and gravel:			
Coral sand for cement manufacture metric tons	106,814	124,980	55,608
River sand for cement manufacture do	60,670	56,056	45,887
River sand and gravel cubic meters	227,190	570,991	551,550
Coral sand and limestone do	396	328	NA
Limestone metric tons	NA	3,066	NA
Other quarried stone cubic meters	218,879	191,831	262,497

See footnotes at end of table.

Table 1.—Other South Pacific Islands: Production of mineral commodities—Continued

Area and commodity	1973	1974	1975 p
NAURU AND OCEAN ISLAND [1]			
Phosphate rock, marketable (exports):			
Nauru ....thousand metric tons..	2,323	2,288	1,533
Ocean Island ....do....	742	548	520
NEW CALEDONIA			
Chromium, chromite, gross weight ....metric tons..	--	--	2,051
Cobalt contained in metallurgical products of nickel:			
In ferronickel e ....do....	1,070	1,450	1,580
In matte e ....do....	150	130	130
Total e ....do....	1,220	1,580	1,710
Jade ("Ouen Island jade") ....kilograms..	1,280	NA	NA
Nickel:			
Ore:			
Gross weight ....thousand metric tons..	5,858	6,961	6,693
Metal content [2] ....metric tons..	r 109,320	128,015	115,761
Metallurgical products, nickel content:			
In ferronickel ....do....	35,759	48,533	52,802
In matte ....do....	21,476	18,837	18,266
Total ....do....	57,235	67,370	71,068
Stone, sand and gravel:			
Stone:			
Crude (unspecified) ....cubic meters..	--	--	58,000
Crushed ....do....	184,000	196,000	170,000
Sand ....do....	103,000	128,000	82,000
Silica (for metallurgical use) ....do....	14,977	18,627	21,358
NEW HEBRIDES [1]			
Manganese:			
Ore ....metric tons..	186,006	r e 295,000	e 290,000
Concentrate, gross weight ....do....	30,133	47,311	46,520
PAPUA NEW GUINEA [1]			
Copper mine output, metal content ....do....	153,953	182,868	172,477
Gold, mine output, metal content ....troy ounces..	566,216	452,773	611,433
Silver, mine output, metal content ....do....	1,196,383	985,675	1,382,341

e Estimate. p Preliminary. r Revised. 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 nickel-cobalt in exported ores.

CHRISTMAS ISLAND

In 1975, phosphate rock and dust was the only mineral commodity produced on Christmas Island. Christmas Island, which is located in the Indian Ocean 1,046 kilometers south of Singapore and about 2,413 kilometers west of Darwin, Australia, has produced phosphate since 1900.

Production of phosphate rock increased about 11% in 1975 owing to strong demand in New Zealand and Malaysia. Phosphate dust, obtained in screening the rock, was exported principally to Malaysia, where it was used on plantations for direct application as a fertilizer.

The base volcanic rock of the island has been covered by coral limestone, which forms an irregular pattern of pinnacles. This in turn was covered by phosphates in beds averaging 6 meters in depth. There are three basic grades of phosphate. The highest grade is mainly apatite, about 36.5% phosphorus oxide. The next highest grade, containing about 33% phosphorus oxide, is basically a mixture of apatite, crandallite, and millisite. Crandallite and millisite predominate in the lowest grade ore, giving an average composition of 25% phosphorus oxide.

Table 2.—Christmas Island: Shipments of phosphate rock by destination

(Thousand metric tons)

Destination	1973	1974	1975
Australia	991	1,222	796
Indonesia	11	24	13
Malaysia and Singapore:			
Malaysia	150	145	132
Singapore	--	--	
New Zealand	341	418	402
Total	1,493	1,809	1,343

Source: The International Superphosphate & Compound Manufacturers' Association Ltd.

FIJI ISLANDS

The value of Fiji's mineral output declined, compared with that of 1974. Gold remained the principal mineral commodity, supplying 66% or $6.3 million [2] of the total mineral value estimated at $9.5 million. River sand and gravel contributed $2.1 million, quarried stone supplied an additional $0.6 million, and the remaining minerals accounted for $0.5 million.

Output of gold by the only producer, Emperor Gold Mining Co. Ltd., declined, as did the price of gold. At mid-year, the gold price was below Fijian production costs, and the company was forced to reduce its workforce of 2,000 employees about 15%. Total mineral output by Emperor Gold Mining was 68,744 troy ounces of gold, 26,462 troy ounces of byproduct silver, and several thousand pounds of byproduct tellurium.

In nonmetallic minerals, production of coral sand for cement, and river sand declined, while output of quarried stone increased.

In late 1975, the diamond drilling program for copper by Amax Exploration (Australia) Inc. and Anglo American Corp. of South Africa Ltd., ended on Viti Levu island. Four large drills were at work at the peak of the program. Drilling was difficult because of the highly weathered overburden and very friable and badly fractured rock. Nevertheless, wire line drilling using triple core barrels resulted in good core recovery. Footage drilled totaled about 25,900 meters. Drilling and assay results were being evaluated to determine if additional exploration was warranted.

[2] Values have been converted from Fiji dollars (FD) to U.S. dollars at the rate of FD1=US$1.25.

Table 3.—Fiji Islands: Exports and reexports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys, all forms	3	1
Copper metal including alloys, all forms	109	77
Gold, bullion ---troy ounces	79,606	68,890
Iron and steel:		
Scrap	249	510
Steel, primary forms	17	138
Semimanufactures	r 687	843
Lead metal including alloys, all forms	21	69
Manganese ore and concentrate	--	559
Silver bullion ---troy ounces	30,683	22,626
Titanium oxide	--	5
Other:		
Ore and concentrates	4	--
Ash and residue containing nonferrous metals	68	61
Metals including alloys, all forms ---value	$500	$4,890
NONMETALS		
Abrasives, natural, n.e.s ---do	r $325	$1,541
Cement	r 12,128	13,682
Chalk ---value	$69	$1
Clays and clay products (including all refractory brick), products:		
Refractory (including nonclay bricks) ---do	$2,045	$1,812
Nonrefractory ---do	$8,207	$17,022
Diatomite and other infusorial earth ---do	$154	$174
Fertilizer materials, manufactured:		
Nitrogenous	96	--
Potassic	9,742	22
Other, including mixed ---value	$233	$7
Lime	4	--
Salt	r 17	8
Sodium compounds, caustic soda	r 3	1
Stone, sand and gravel ---value	$2,622	$176
Sulfur, sulfuric acid ---do	$139	$214
Other nonmetals, n.e.s., slag, dross, and similar waste, not metal bearing	17	6
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	244	(1)
Hydrogen, nitrogen, rare gases ---value	$925	$687
Petroleum refinery products:		
Gasoline (including natural):		
Motor ---thousand 42-gallon barrels	47	80
Aviation ---do	1	15
Kerosine and jet fuel ---do	857	760
Distillate fuel oil ---do	524	274
Residual fuel oil ---do	191	127
Lubricants ---do	5	5
Other:		
White spirits ---do	6	4
Liquefied petroleum gas ---do	1	1
Total ---do	1,632	1,266
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals ---value	$1,058	$1,752

r Revised.
1 Less than ½ unit.

Table 4.—Fiji Islands: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
METALS		
Aluminum metal including alloys, all forms ---value, thousands	$562	$532
Copper metal including alloys:		
Matte	1	(1)
Scrap	56	19
Unwrought and semimanufactures	281	106
Gold metal, unworked or partly worked ---troy ounces	113	289
Iron and steel metal:		
Scrap	42	2
Pig iron including cast iron	123	134
Ferroalloys and similar materials ---value	$2,056	$4,728
Steel, primary forms	r 4,103	4,222

See footnotes at end of table.

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

Commodity	1973	1974
METALS—Continued		
Iron and steel metal—Continued		
Semimanufactures:		
Bars, rods, angles, shapes, sections	r 8,484	9,922
Universals, plates, sheets	r 11,646	8,059
Hoop and strip	25	238
Rails and accessories ....value, thousands	$192	$334
Wire	r 2,134	1,335
Tubes, pipes, fittings	r 1,867	1,266
Castings and forgings, rough ....value, thousands	r $52	$15
Lead metal including alloys, all forms ....do	$120	$149
Nickel metal including alloys, all forms ....value	$760	$3,883
Platinum-group metals including alloys ....troy ounces	r 36	24
Tin metal including alloys, all forms ....value	$40,106	$67,758
Titanium oxides	191	241
Zinc metal including alloys:		
Scrap ....value	$606	$3,752
Blue powder ....do	$21,577	$47,709
Unwrought	r 58	31
Semimanufactures ....value	r $45,753	$23,507
Other:		
Oxides, hydroxides and peroxides of metal, n.e.s ....do	$101,663	$101,198
Ores and concentrates, ash and residue ....do	$38	--
Metals including alloys, all forms, pyrophoric alloys ....do	r $4,832	$7,303
NONMETALS		
Abrasives, natural ....do	$100,520	$137,985
Asbestos	1	2
Barite and witherite	13	15
Cement	759	274
Chalk, earth colors, etc	r 115	233
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	r 67	38
Products:		
Refractory (including nonclay brick) ....value	$43,986	$96,656
Nonrefractory ....do	$383,961	$665,994
Diamond, industrial ....do	$1,572	$23,685
Diatomite and other infusorial earth	88	65
Fertilizer materials:		
Crude:		
Nitrogenous	52	--
Potassic	15	12
Manufactured:		
Nitrogenous	32,393	21,832
Phosphatic	8,671	6,298
Potassic	615	4,217
Other including mixed	457	558
Graphite, natural ....value	$649	$675
Gypsum and plasters	4,157	5,051
Precious and semiprecious stones, except diamond ....value, thousands	$121	$50
Salt	2,764	2,030
Sodium compounds, caustic soda	607	1,080
Stone, sand and gravel:		
Dimension stone and gravel ....value	$12,404	$74,991
Sand, excluding metal bearing	352	315
Sulfur including sulfuric acid ....value	$61,991	$36,803
Other nonmetals, n.e.s.:		
Crude ....do	$2,152	$3,885
Slag, dross and similar waste, not metal bearing ....do	$137	$3,041
Unspecified ....do	$5,174	$9,787
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	r 213	1,276
Coal, coke and peat	204	7,320
Hydrogen, nitrogen, rare gases ....value	r $10,619	$6,664
Petroleum refinery products:		
Gasoline (including natural):		
Motor ....thousand 42-gallon barrels	338	413
Aviation ....do	29	6
Kerosine ....do	139	167
Jet fuel ....do	839	810
Distillate ....do	r 1,003	1,058
Residual ....do	1	247
Lubricants ....do	32	22
Other:		
Liquefied petroleum gas ....do	12	22
Naphtha ....do	27	25
Unspecified ....do	16	16
Total ....do	r 2,436	2,786
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals ....value	r $30,726	$30,791

r Revised.
1 Less than ½ unit.

NAURU AND OCEAN ISLAND

The Republic of Nauru and Ocean Island lie just south of the equator, halfway between Honolulu, Hawaii and Melbourne, Australia. Nauru is the smallest independent republic in the world; its total area is 22 square kilometers. Phosphate rock was the only mineral produced on both islands, and the total production was exported.

During 1975, total combined output of the Republic decreased 4% below that of 1974, because of decreased demand in Australia and New Zealand, which had imported over 95% of the phosphate produced. Nauru rock was high grade, averaging 83% phosphate.

Installation of a calcining plant by Nauru Phosphate Corp. was completed in early 1975. However, calcined rock production, originally scheduled to start in June, was delayed. Samples were exported to Japan in late 1975 for testing by local manufacturers. If satisfactory, it was expected that commercial exports would commence in early 1976. Surface rock not previously exported was to be treated in the new plant. The product was lower in both carbon and cadmium than the untreated rock. Capacity of the two calciners in the plant was approximately 400,000 tons per year.

Table 5.—Nauru and Ocean Island: Shipments of phosphate rock by destination
(Thousand metric tons)

Destination	Nauru		Ocean Island	
	1974	1975	1974	1975
Australia	1,527	918	293	303
Japan	NA	114	--	--
Korea, Republic of	NA	50	--	--
New Zealand	368	417	256	218
Taiwan	NA	12	--	--
Undistributed	393	23	--	--
Total	2,288	1,534	549	521

NA Not available.
Source: International Superphosphate & Compound Manufacturers' Association Ltd.

NEW CALEDONIA

The French island territory of New Caledonia is situated in the South Pacific. Its area covers approximately 20,720 square kilometers. Melanesians and Europeans, in about equal numbers, account for 80% of a population totaling 130,000. The political and administrative organization of New Caledonia was located at Noumea and was headed by a High Commissioner, a Territorial Assembly, and a Council of Government. In Paris, the Territory was represented in the French Parliament by one deputy and one senator.

A significant development in 1975 was the resolution of the long-standing tax problem between Société Nationale des Pétroles d'Aquitaine (SNPA), a French oil company, and the Government of New Caledonia. Taxes in the past were based on an 11% value—added tax on all nickel exports. The new tax would be a 50% tax on profits from the export of ferronickel and matte. The French Government would make up any differences in revenues to the Government of New Caledonia that occur during a 5-year transition period.

PRODUCTION

The economy of the island was almost exclusively concerned with producing nickel, and New Caledonia was the second largest producer among the market economy countries during 1975. The principal New Caledonian nickel producer was Société Anonyme le Nickel S.A. (SLN). During the year ownership of SLN was acquired equally by Imétal and SNPA. A record 71,000 tons of nickel was produced as a result of improvements in pyrometallurgical techniques. The furnaces were originally designed to produce only 60,000 tons of nickel. The company's research facilities at Trappes perfected an electrowinning process for treating New Caledonian matte that could result in a high-purity nickel product suitable for use in the most demanding alloys.

TRADE

Mineral exports, consisting mostly of nickel ore, ferronickel, and nickel-cobalt matte, were valued at about \$371 million[3] in 1975, compared with \$259 million in 1974. Exports of nickel ore, principally to Japan, decreased from 3.3 million tons in 1974 to 2.5 million tons in 1975. The average grade of nickel ore exported increased slightly to 2.65% nickel, from 2.46% nickel in 1974. Exports of ferronickel and matte during 1975 totaled 62,076 tons nickel content, 42,659 tons in ferronickel, and 19,417 tons in matte. Most of the ferronickel (70%) and matte (50%) exported went to France. The United States received 22% of the ferronickel, Japan, 6%, and Australia, 2%. Japan and the United States received 30% and 20%, respectively, of the matte.

[3] Values have ben converted from New Caledonia francs (CFPF) to U.S. dollars at the rate of CFPF1=US\$0.77.

Table 6.—New Caledonia: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity[1]	1973	1974	1975
Chromite, gross weight (50.045% Cr_2O_3)	--	3,566	1,001
Nickel ore, gross weight[2] ____thousand tons	2,803	3,347	2,466
Smelter products, nickel content:			
Ferronickel:			
Electric grade (FN4 grade, 25.1% nickel-cobalt)	8,922	12,431	11,546
Sulfur extracted grade (FN3 grade, 24.5% nickel-cobalt)	7,786	8,620	10,613
Refined grade (FN2 grade, 26.3% nickel-cobalt)	527	670	382
Overrefined grade (FN1 grade, 27.5% nickel-cobalt)	7,518	9,896	9,014
Other:			
FN5 grade, nickel-cobalt content not specified	106	442	--
FNC grade, nickel-cobalt content not specified	8,499	15,014	11,104
Nickel matte (79% nickel-cobalt)	16,784	20,073	19,417

[1] Cobalt content of smelter products not available.
[2] Nickel-cobalt content is reported as follows in tons: 1973—52,085; 1974—60,645; 1975—44,693.

Source: Service de la Statistique. Annuaire Statistique de la Nouvelle Caledonie, 1976. Noumea, 1976, pp. 107–113.

Table 7.—New Caledonia: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1973	1974
Cement	85,598	98,712
Coal	102,926	108,665
Coke	--	18,858
Gypsum	61,707	13,535
Iron and steel:		
Bars	8,888	6,014
Angles, shapes, sections	3,067	3,578
Plates and sheets	4,294	6,021
Petroleum refinery products:		
Gasoline ____thousand 42-gallon barrels	r 420	346
Kerosine ____do	37	37
Distillate fuel oil ____do	412	1,068
Residual fuel oil ____do	r 4,420	4,183

r Revised.

Source: Service de la Statistique. Annuaire Statistique de la Nouvelle Caledonie, 1976. Noumea, 1976, pp. 177–178.

COMMODITY REVIEW

Metals.—*Chromite.*—Société de la Tiebaghi produced 2,050 tons of chromite ore. The ore contained 47% Cr_2O_3 and 2.5% moisture. Japan received 1,000 tons of this ore as a 48.8% Cr_2O_3 concentrate.

Nickel.—Nickel ore production dropped in 1975 to 6,693,000 tons, compared with 6,961,000 tons in 1974. Again, SLN was New Caledonia's main ore producer and the only producer of refined nickel. In 1975, SLN's Doniambo refinery produced 71,068 tons of nickel (18,266 tons in matte and 52,802 tons in ferronickel), compared with 67,370 tons in 1974 (18,837 tons in matte and 48,533 tons in ferronickel). The production capacity of the Doniambo works, provided entirely by electric furnaces, was more than 70,000 tons of nickel per year. An extensive expansion program in both mineral and metallurgical processing was completed. As a result, metallurgical production was conducted in three electric melting furnaces, each of 33,000 kilowatt power rating. The main product of the Doniambo works was ferronickel. The other largest product was nickel matte, which was exported to Japan where it was converted into nickel oxide. Matte was also exported to France, where it was refined to nickel metal.

New Caledonia contains large reserves of the mineral garnierite, which contains 2% to 3% nickel and is well suited for pyrometallurgical processing. Company officials estimate the reserves of garnierite ore on the island to be 300 million tons. Laterites, which are also present on the island, contain 1.2% to 1.6% nickel but require a complex technology that consumes more energy. Reserves of laterite in New Caledonia were estimated at several billion tons.

Agreement on the development of lateritic nickel deposits on the island was reached between Patino N.V. of the Netherlands and the French Government. Under the agreement, Patino is to sell a 90% interest in its French subsidiary, Compagnie Française d'Entreprises Minières Metallurgiques et d'Invistessements (COFREMMI), to Bureau de Recherches Géologiques et Minières, (BRGM), a French Government agency. The price is $9 million in cash, in addition to royalty and profit participation valued at about $8 million. According to Patino officials, COFREMMI would then develop its Tiebaghi and Poum deposits in the northern part of the island, as well as the Ile Art deposit, which is to be transferred to COFREMMI by BRGM. Feasibility studies and metallurgical testing have begun. When the mining and milling complex in New Caledonia is completed, output is expected to be 33,000 to 44,000 tons of ferronickel per year. The agreement concluded 2 years of negotiations over the fate of the nickel deposits.

NEW HEBRIDES

In 1975, mineral activity in the New Hebrides was confined to the production of manganese ore. Production by Compagnie Française des Phosphates de L'Oceanie at the Forari manganese mine on Efate (Vate) Island declined slightly below that of 1974. The ore was exported mainly to Japan as a 42% manganese concentrate. The 10-year production and export data follow, in tons of contained manganese:

Year	Production	Exports
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	10,840
1974	19,871	17,225
1975	19,538	NA

NA Not available.

PAPUA NEW GUINEA

The mineral industry in the newly independent nation of Papua New Guinea faced problems in both marketing and production during 1975. A decline in domestic mine production, dominated by copper, was evident in early 1975, as the world-wide recession was felt. The sharp fall in world copper prices forced earnings of Bougainville Copper Pty. Ltd., the nation's principal mine, down from $114.5 million[4] in 1974 to $46.1 million in 1975. This drop in earnings followed a $100 million drop in gross sales revenue, from $294 million in 1974 to $194 million during 1975. This resulted in an overall value of mineral output of $230 million, a decrease of nearly 22% below the $294 million reported for 1974.

Political independence came to Papua New Guinea on September 16, 1975, and the country's currency, the kina, was introduced in April 1975. Although the budget was expected to depend heavily on Australian aid, new taxes were generated within the country, principally from revised mining taxation laws. The Government moved to create a firm financial foundation which will obviate the need for another Bougainville contract negotiation in which taxes are increased.

PRODUCTION

Kennecott Pacific Pty. Ltd., and the Government were involved in negotiations with regard to taxes and royalties on development of the copper deposit of OK Tedi Development Co. for about 3 years. The two were unable to reach a satisfactory agreement, and Kennecott withdrew from the project.

The new tax law provided for only one charge on sales (a 1.25% royalty on proceeds of sales), and net transportation and smelting charges. This royalty is to be paid to the central Government, which in turn makes a portion of the proceeds available to the respective landowners. This payment meets all obligations to reward local groups for the use of their land. Companies were required to work within the Income Tax Act, which provides for a tax on company income (presently 33.33%) and on dividends paid overseas (a dividend withholding tax of 15%). There was no withholding tax on interest, and amortization of nondepreciable assets extends over the life of the mine.

A number of other issues were involved in Papua New Guinea's mineral development. These included investment guarantees by the Government and also the right of the operator to develop a project once it had been proven to be commercially viable. It is expected that these issues will be resolved during 1976. In the meantime, a number of firms continued to invest sizable sums of money in various mineral prospects. Kennecott, before its withdrawal, spent approximately 6 years and $18 million developing the OK Tedi copper prospect. Oil companies have spent almost $100 million over the years in search for oil or natural gas in commercial quantities. This work was continuing in the Gulf of Papua and onshore along the coast.

COMMODITY REVIEW

Metals.—*Copper.*—As in preceding years, total Papua New Guinea copper output was from the Panguna mine on Bougainville Island. This mine accounted for virtually all mine output, and contributed nearly 11% of the total ($425 million) export earnings in 1975. The operating company is Bougainville Copper Pty. Ltd., in which Conzinc Riotinto of Australia holds 53.6% of the shares, the Government 20%, and public shareholders 26.4%. The public shareholders include 9,000 Papua New Guineans. Production in 1975 totaled 172,477 tons of contained copper, compared with 182,868 tons in 1974. Output in the first half of the year was restricted for a short period because of a civil disturbance on the island. This caused copper production to fall to 79,171 tons in the 6 months ending June 30, some 10,000 tons below the corresponding period of 1974. Concentrate production for the year fell from 640,818 tons to 595,946 tons. The average grade for gold and copper, however, rose slightly giving a better yield from ore. The concentrate grade was 29.23% copper, 35.8 grams of gold per ton, and 70.94 grams of silver per ton.

The Panguna copper deposit is a porphyry type situated in the Kawerong Valley on the western slope of the Crown Prince Range in south-central Bougainville. Copper-gold mineralization with small quantities of silver and molybdenum is associated with a group of acid-to-intermediate intrusives. In the mineralized area the principal member is the Panguna andesite, consisting of massive flow rocks; they have been exposed and drilled to a

[4] Unless otherwise indicated, values have been converted from Papua New Guinea kinas (K$) to U.S. dollars at the rate of K$1=US$1.32.

thickness of some 900 meters. A recently completed evaluation program indicated reserves of approximately 870 million tons averaging 0.47% copper and 0.62 gram of gold per ton.

The Government-owned OK Tedi Development Co. was trying to establish total copper reserves of a deposit in the Star Mountains in northwest Papua New Guinea. Initial drilling results from a new test program were released in September 1975. Three vertical holes were drilled along the southern perimeter of the main porphyry deposit and three in a magnetite skarn deposit. The assays for the main deposit were: Hole one, 0.72% copper from 183 to 200 meters and 0.78% copper from 226 to 261 meters; and hole two, 0.99% copper from 125 to 331 meters; the third bore showed low-grade ore, and no figures were given. In the northwestern skarn deposit, drilling intersected 5.6 grams of gold per ton of ore from 30 to 40 meters, 1.14% copper from the surface to 105 meters, and 1.95% copper near the surface of the third drill hole. A government statement said preliminary metallurgical tests indicated 88% of the copper in the porphyry body can be recovered, and in the skarn ore 82% can be recovered.

Several companies led by Broken Hill Proprietary Ltd. (BHP) were negotiating with Papua New Guinea to develop the OK Tedi deposit. Companies expected to be involved are Mount Isa Mines Ltd., Placer Development Ltd., and Sumitomo Metals Mining Co. Ltd. Mount Isa and Placer were already involved in mining exploration in Papua New Guinea. Sumitomo participation was likely because Japan will probably be the biggest consumer of Papua New Guinea production. If the project proves economically attractive, production at an annual rate of 100,000 tons per year of copper concentrates was scheduled for 1983.

Three other copper prospects appeared promising. The most advanced was at Frieda River, where Mount Isa and Sumitomo spent about $10 million on development work. Reserves were estimated at approximately 500 million tons of low-grade porphyry ore. Another $10 million has been expended at the Yandera copper prospect, which is near the Frieda River Prospect. Drilling at Yandera has outlined indicated reserves of 124 million tons of ore, plus inferred reserves of an additional 214 million tons reported by Triako Mines, one of the three joint venturers. Mineralization was contained within three zones, with average grades assaying 0.42% copper, and 2.16 grams of silver ore per ton. Triako also announced that additional mineralization occurred in two of the three zones, but further work was required for tonnage assessment. Results of initial metallurgical testing were described as encouraging but uneconomic at present copper prices.

Other metals exploration was being financed by a variety of Japanese, Australian, and South African groups. Known mineralization included nickel, bauxite, gold, and titanium. A possible gold mine on Misima Island in Milne Bay was being tested. Work was in the initial stages, but geologists were optimistic that if the price of gold remained high the mine would be a profitable venture.

Mineral Fuels.—*Petroleum.*—There have been no commercial discoveries of oil and gas in Papua New Guinea. However, the U.S., Japanese, United Kingdom, and Australian companies were searching for oil and gas. In the Gulf District a partnership of BHP and Mobil Oil Corp. found a natural gas deposit containing estimated reserves of 1,000 billion cubic feet. It is considered that three times this reserve would be needed for a commercial field. A Japanese consortium, registered in Papua New Guinea as the PNG Petroleum Pty. Ltd., planned to drill nine wells. Half of the company is owned by Japan Petroleum Development Corp., and the other half is owned by Nippon Mining Co. Ltd. and several other Japanese firms.

Gas has also been found offshore in the Gulf of Papua by Phillips Petroleum Corp. Esso Australia Ltd. committed $17 million for which it will be entitled to 50% of any new discoveries by Phillips Petroleum Corp.

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